VOLUME 6

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

GREGORY CANYON LANDFILL

San Diego County, California

APPENDIX K–NOISE AND VIBRATION

- Construction, PCR Services Corporation, June 2012
- Roadway Traffic Noise Calculations, PCR Services Corporation, May 2012
- Vibration Technical Report on Construction Blasting Operations at the Gregory Canyon Landfill, Ogden Environmental and Energy Services, Co., Inc., March 7, 1996
- Ground Vibration Addendum Study (ISE Report #98-016), Investigative Science and Engineering, December 4, 1998
- Chapter 4.6, Noise, Sycamore Landfill Master Plan Final EIR, BRG Consulting, Inc., September 2008

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Access Road and Bridge***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	3200	0
Graders	1	85	40%	3200	0
Dozer	1	82	40%	3200	0
Compactor (Ground)	1	83	20%	3200	0
Drill Rig Truck	1	79	20%	3200	0
Water Trucks	2	80	10%	3200	0
Excavator	1	81	40%	3200	0
Rubber Tired Loader	1	79	50%	3200	0

Receptor:

Results:

Hourly Leq: **50**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Borrow Stock Pile A and B***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	5	84	40%	500	10

Receptor: ***R3***

Results:

Hourly Leq: **57**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Ancillary Facilities Area***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	5000	0
Graders	1	85	40%	5000	0
Dozer	1	82	40%	5000	0
Excavator	1	81	40%	5000	0
Rubber Tired Loader	1	79	50%	5000	0

Receptor:

Results:

Hourly Leq: **45**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	3930	0
Graders	1	85	40%	3930	0
Dozer	3	82	40%	3930	0
Compactor (Ground)	3	83	20%	3930	0

Receptor: ***R1***

Results:

Hourly Leq: 50

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation Borrow/Stockpile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	800	15

Receptor: ***R1***

Results:

Hourly Leq: **51**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	2600	0
Graders	1	85	40%	2600	0
Dozer	3	82	40%	2600	0
Compactor (Ground)	3	83	20%	2600	0

Receptor: ***R2***

Results:

Hourly Leq: **54**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation Borrow/Stockpile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1500	15

Receptor: ***R2***

Results:

Hourly Leq: **45**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1300	0
Graders	1	85	40%	1300	0
Dozer	3	82	40%	1300	0
Compactor (Ground)	3	83	20%	1300	0

Receptor: ***R3***

Results:

Hourly Leq: **60**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation Borrow/Stockpile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	500	15

Receptor: ***R3***

Results:

Hourly Leq: **55**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1900	0
Graders	1	85	40%	1900	0
Dozer	3	82	40%	1900	0
Compactor (Ground)	3	83	20%	1900	0

Receptor: ***R4***

Results:

Hourly Leq: **56**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon Landfill Applicant's Proposed Alternative

Construction Phase: ***Periodic Landfill Operation Borrow/Stockpile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	2600	15

Receptor: ***R4***

Results:

Hourly Leq: **41**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Potential Stock Pile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	450	0
Scrapers	3	84	40%	650	0
Scrapers	3	84	40%	850	0

Receptor: ***R3***

Results:

Hourly Leq: 67

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: *Access Road*

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Water Trucks	1	80	10%	400	0
Graders	1	85	40%	600	0
Dozer	1	82	40%	600	0
Compactor (Ground)	1	83	20%	600	0

Receptor:

Results:

Hourly Leq: 62

Source for Ref. Noise Levels: FHWA, RCNM 2005

PCR

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Ancillary Facilities Area***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	1320	0
Graders	1	85	40%	1320	0
Dozer	1	82	40%	1320	0
Excavator	1	81	40%	1320	0
Rubber Tired Loader	1	79	50%	1320	0

Receptor:

Results:

Hourly Leq: **57**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	500	10
Graders	1	85	40%	500	10
Dozer	3	82	40%	500	10
Compactor (Ground)	3	83	20%	500	10

Receptor: ***A1***

Results:

Hourly Leq: 58

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	840	15

Receptor: ***A1***

Results:

Hourly Leq: **51**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	2200	10
Graders	1	85	40%	2200	10
Dozer	3	82	40%	2200	10
Compactor (Ground)	3	83	20%	2200	10

Receptor: ***A2***

Results:

Hourly Leq: 45

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	450	15

Receptor: ***A2***

Results:

Hourly Leq: **56**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1700	10
Graders	1	85	40%	1700	10
Dozer	3	82	40%	1700	10
Compactor (Ground)	3	83	20%	1700	10

Receptor: ***A3***

Results:

Hourly Leq: 47

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Aspen Road Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	500	15

Receptor: ***A3***

Results:

Hourly Leq: **55**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Access Road***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Water Trucks	1	80	10%	600	0
Graders	1	85	40%	800	0
Dozer	1	82	40%	800	0
Compactor (Ground)	1	83	20%	800	0

Receptor:

Results:

Hourly Leq: 60

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Potential Stock Pile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	700	0
Scrapers	3	84	40%	900	0
Scrapers	3	84	40%	1100	0

Receptor: ***G2***

Results:

Hourly Leq: **64**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Ancillary Facilities Area***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	1000	0
Graders	1	85	40%	1000	0
Dozer	1	82	40%	1000	0
Excavator	1	81	40%	1000	0
Rubber Tired Loader	1	79	50%	1000	0

Receptor:

Results:

Hourly Leq: **59**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	500	10
Graders	1	85	40%	500	10
Dozer	3	82	40%	500	10
Compactor (Ground)	3	83	20%	500	10

Receptor: ***G1***

Results:

Hourly Leq: **58**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1900	0

Receptor: ***G1***

Results:

Hourly Leq: **58**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1400	10
Graders	1	85	40%	1400	10
Dozer	3	82	40%	1400	10
Compactor (Ground)	3	83	20%	1400	10

Receptor: ***G2***

Results:

Hourly Leq: **49**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	700	10

Receptor: ***G2***

Results:

Hourly Leq: 57

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	2700	10
Graders	1	85	40%	2700	10
Dozer	3	82	40%	2700	10
Compactor (Ground)	3	83	20%	2700	10

Receptor: ***G3***

Results:

Hourly Leq: **43**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Gopher Canyon Alternative

Construction Phase: ***Periodic Construction Borrow/Stockpile***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1700	10

Receptor: ***G3***

Results:

Hourly Leq: 49

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Access Road***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Water Trucks	1	80	10%	600	0
Graders	1	85	40%	800	0
Dozer	1	82	40%	800	0
Compactor (Ground)	1	83	20%	800	0

Receptor:

Results:

Hourly Leq: **60**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Potential Stock Pile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1700	0
Scrapers	3	84	40%	1900	0
Scrapers	3	84	40%	2100	0

Receptor: ***M3 & M4***

Results:

Hourly Leq: 57

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Ancillary Facilities Area***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	800	0
Graders	1	85	40%	800	0
Dozer	1	82	40%	800	0
Excavator	1	81	40%	800	0
Rubber Tired Loader	1	79	50%	800	0

Receptor: ***M1***

Results:

Hourly Leq: 61

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1600	0
Graders	1	85	40%	1600	0
Dozer	3	82	40%	1600	0
Compactor (Ground)	3	83	20%	1600	0

Receptor: ***M1***

Results:

Hourly Leq: 58

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	3500	0

Receptor: ***M1***

Results:

Hourly Leq: **53**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1600	0
Graders	1	85	40%	1600	0
Dozer	3	82	40%	1600	0
Compactor (Ground)	3	83	20%	1600	0

Receptor: ***M2***

Results:

Hourly Leq: 58

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	4500	0

Receptor: ***M2***

Results:

Hourly Leq: 51

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	4500	0
Graders	1	85	40%	4500	0
Dozer	3	82	40%	4500	0
Compactor (Ground)	3	83	20%	4500	0

Receptor: ***M3***

Results:

Hourly Leq: 49

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1700	0

Receptor: ***M3***

Results:

Hourly Leq: **59**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	2500	0
Graders	1	85	40%	2500	0
Dozer	3	82	40%	2500	0
Compactor (Ground)	3	83	20%	2500	0

Receptor: ***M4***

Results:

Hourly Leq: 54

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Merriam Mountain Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1300	5

Receptor: ***M4***

Results:

Hourly Leq: 57

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Access Road***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Water Trucks	1	80	10%	1000	0
Graders	1	85	40%	1200	0
Dozer	1	82	40%	1200	0
Compactor (Ground)	1	83	20%	1200	0

Receptor:

Results:

Hourly Leq: 56

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Potential Stock Pile Areas***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1500	0
Scrapers	3	84	40%	1700	0
Scrapers	3	84	40%	1900	0

Receptor: ***E2***

Results:

Hourly Leq: 58

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Ancillary Facilities Area***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Cranes	1	81	40%	2000	0
Graders	1	85	40%	2000	0
Dozer	1	82	40%	2000	0
Excavator	1	81	40%	2000	0
Rubber Tired Loader	1	79	50%	2000	0

Receptor:

Results:

Hourly Leq: **53**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1000	10
Graders	1	85	40%	1000	10
Dozer	3	82	40%	1000	10
Compactor (Ground)	3	83	20%	1000	10

Receptor: ***E1***

Results:

Hourly Leq: **52**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	3500	10

Receptor: ***E1***

Results:

Hourly Leq: **43**

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	2	84	40%	1000	10
Graders	1	85	40%	1000	10
Dozer	3	82	40%	1000	10
Compactor (Ground)	3	83	20%	1000	10

Receptor: ***E2***

Results:

Hourly Leq: 52

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS East Otay Mesa Alternative

Construction Phase: ***Periodic Construction and Concurrent Landfill Operation***

Equipment

Description	No. of Equip.	Reference Noise Level at 50ft, Lmax	Acoustical Usage Factor	Distance to Receptor, ft	Estimated Noise Shielding, dBA
Scrapers	10	84	40%	1500	10

Receptor: ***E2***

Results:

Hourly Leq: 50

Source for Ref. Noise Levels: FHWA, RCNM 2005

Project: Gregory Canyon EIS Applicant's Proposed Alternative

Roadway/Segment	Speed MPH	Traffic Volumes AM	Traffic Volumes PM	Traffic Volumes ADT	Leq ROW	Leq 25 Feet	Leq 100 Feet	CNEL ROW	CNEL 25 Feet	CNEL 100 Feet	Distance, Feet 60 CNEL	Distance, Feet 65 CNEL	Distance, Feet 70 CNEL
Existing													
SR 76 w/o Old Highway 395	35	1368	1877	0	72.4	68.3	63.8	73.6	69.6	65.0	352	100	21
SR 76 e/o Old Highway 395	35	1214	1584	0	71.7	67.6	63.1	72.9	68.8	64.3	298	83	15
SR 76 w/o I-15	40	831	1433	0	70.6	67.7	63.7	71.9	68.9	64.9	366	99	14
SR 76 between I-15 and Pankey Road	40	660	1074	0	69.4	66.4	62.4	70.6	67.6	63.6	265	67	4
SR 76 between Pankey Road and Rice Canyon Road	40	517	627	0	67.0	64.1	60.1	68.3	65.3	61.3	146	29	-8
Future No Project													
SR 76 w/o Old Highway 395	35	2693	3151	0	74.7	70.6	66.1	75.9	71.8	67.3	610	182	47
SR 76 e/o Old Highway 395	35	2493	2841	0	74.2	70.1	65.6	75.4	71.4	66.8	542	160	40
SR 76 w/o I-15	40	2486	3121	0	74.0	71.0	67.1	75.2	72.2	68.3	811	239	58
SR 76 between I-15 and Pankey Road	40	2073	2437	0	72.9	70.0	66.0	74.2	71.2	67.2	639	185	41
SR 76 between Pankey Road and Rice Canyon Road	40	1950	2677	0	73.4	70.4	66.4	74.6	71.6	67.6	703	205	48
Future With Project													
SR 76 w/o Old Highway 395	35	2713	3171	0	74.7	70.6	66.1	75.9	71.8	67.3	610	182	47
SR 76 e/o Old Highway 395	35	2513	2861	0	74.2	70.2	65.7	75.5	71.4	66.9	555	164	41
SR 76 w/o I-15	40	2616	3249	0	74.2	71.2	67.2	75.4	72.4	68.5	851	252	62
SR 76 between I-15 and Pankey Road	40	2257	2619	0	73.3	70.3	66.3	74.5	71.5	67.5	687	200	46
SR 76 between Pankey Road and Rice Canyon Road	40	2202	2912	0	73.7	70.7	66.8	74.9	71.9	68.0	756	222	53

CNEL

Summary	25 ft. from ROW		At ROW	
Roadway/Segment	Project Increment	Cumulative Increment	Project Increment	Cumulative Increment
SR 76 w/o Old Highway 395	0.0	2.2	0.0	2.3
SR 76 e/o Old Highway 395	0.0	2.6	0.1	2.6
SR 76 w/o I-15	0.2	3.5	0.2	3.5
SR 76 between I-15 and Pankey Road	0.3	3.9	0.3	3.9
SR 76 between Pankey Road and Rice Canyon Road	0.3	6.6	0.3	6.6

	% of ADT			
Vehicle Type	Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS Applicant's Proposed Alternative

Existing														
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
SR 76 between Rice Canyon Road and Couser Canyon Road	35	512	596	0	67.4	63.4	58.8	68.6	64.6	60.1	100	21	-4
SR 76 between Couser Canyon Road and Project Access	35	518	682	0	68.0	63.9	59.4	69.2	65.2	60.7	118	26	-3
Interstate 15 Northbound Ramp SR 76	35	262	501	0	66.7	62.6	58.1	67.9	63.8	59.3	131	24	-10
Interstate 15 Southbound Ramp SR 76	35	440	506	0	66.7	62.7	58.1	67.9	63.9	59.4	131	24	-10
0	0			0	-	-	-	-	-	-	-	-	-

Future No Action													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
SR 76 between Rice Canyon Road and Couser Canyon Road	35	1707	2235	0	73.2	69.1	64.6	74.4	70.3	65.8	427	124	28
SR 76 between Couser Canyon Road and Project Access	35	1588	2140	0	73.0	68.9	64.4	74.2	70.1	65.6	407	118	26
Interstate 15 Northbound Ramp SR 76	35	647	1131	0	70.2	66.1	61.6	71.4	67.4	62.8	324	85	10
Interstate 15 Southbound Ramp SR 76	35	575	797	0	68.7	64.6	60.1	69.9	65.8	61.3	222	53	-1
0	0			0	-	-	-	-	-	-	-	-	-

Future With Federal Action													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
SR 76 between Rice Canyon Road and Couser Canyon Road	35	1960	2470	0	73.6	69.5	65.0	74.8	70.7	66.2	470	138	33
SR 76 between Couser Canyon Road and Project Access	35	1749	2263	0	73.2	69.2	64.6	74.4	70.4	65.9	427	124	28
Interstate 15 Northbound Ramp SR 76	35	741	1223	0	70.6	66.5	62.0	71.8	67.7	63.2	357	96	13
Interstate 15 Southbound Ramp SR 76	35	590	812	0	68.8	64.7	60.2	70.0	65.9	61.4	227	55	0
0	0			0	-	-	-	-	-	-	-	-	-

Summary	CNEL 25 ft. from ROW		At ROW	
Roadway/Segment	Project Increment	Cumulative Increment	Project Increment	Cumulative Increment
SR 76 between Rice Canyon Road and Couser Canyon Road	0.4	6.1	0.4	6.2
SR 76 between Couser Canyon Road and Project Access	0.3	5.2	0.2	5.2
Interstate 15 Northbound Ramp SR 76	0.3	3.9	0.4	3.9
Interstate 15 Southbound Ramp SR 76	0.1	2.0	0.1	2.1
0	-	-	-	-

	% of ADT			
Vehicle Type	Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS Applicant's Proposed Alternative

Existing													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Old Highway 395 n/o SR 76	35	450	419	0	66.2	62.1	57.6	67.4	63.4	58.8	72	12	-7
Old Highway 395 s/o SR 76	35	576	726	0	68.3	64.2	59.7	69.5	65.4	60.9	127	29	-2
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-
Future No Action													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Old Highway 395 n/o SR 76	35	1150	1083	0	70.3	66.2	61.7	71.5	67.4	62.9	211	56	7
Old Highway 395 s/o SR 76	35	1316	1495	0	71.4	67.4	62.8	72.6	68.6	64.1	277	77	13
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-
Future With Federal Action													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Old Highway 395 n/o SR 76	35	1150	1083	0	70.3	66.2	61.7	71.5	67.4	62.9	211	56	7
Old Highway 395 s/o SR 76	35	1316	1495	0	71.4	67.4	62.8	72.6	68.6	64.1	277	77	13
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-
0	0			0	-	-	-	-	-	-	-	-	-

	CNEL			
Summary	25 ft. from ROW		At ROW	
Roadway/Segment	Project Increment	Cumulative Increment	Project Increment	Cumulative Increment
Old Highway 395 n/o SR 76	0.0	4.0	0.0	4.1
Old Highway 395 s/o SR 76	0.0	3.2	0.0	3.1
0	-	-	-	-
0	-	-	-	-
0	-	-	-	-

	% of ADT			
Vehicle Type	Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS Aspen Road

Existing													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Mission Road w/o Live Oak Park Road	35			19490	72.1	68.0	63.5	73.3	69.3	64.8	328	93	18
Mission Road e/o Live Oak Park Road	35			21960	72.6	68.6	64.1	73.9	69.8	65.3	379	109	23
Old Highway 395 n/o Mission Road	35			5090	66.3	62.2	57.7	67.5	63.4	58.9	74	13	-7
Rainbow Glen Road w/o Old Highway 395	35			960	59.0	55.0	50.5	60.3	56.2	51.7	1	-11	-14
0	0			0	-	-	-	-	-	-	-	-	-
Future No Action													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Mission Road w/o Live Oak Park Road	35			33130	74.4	70.4	65.8	75.6	71.6	67.1	568	169	42
Mission Road e/o Live Oak Park Road	35			37320	74.9	70.9	66.4	76.2	72.1	67.6	655	196	51
Old Highway 395 n/o Mission Road	35			9180	68.9	64.8	60.3	70.1	66.0	61.5	149	36	0
Rainbow Glen Road w/o Old Highway 395	35			960	59.0	55.0	50.5	60.3	56.2	51.7	1	-11	-14
0	0			0	-	-	-	-	-	-	-	-	-
Future With Alternative													
	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Mission Road w/o Live Oak Park Road	35			33220	74.4	70.4	65.9	75.7	71.6	67.1	582	173	44
Mission Road e/o Live Oak Park Road	35			37410	75.0	70.9	66.4	76.2	72.1	67.6	655	196	51
Old Highway 395 n/o Mission Road	35			11230	69.7	65.7	61.1	70.9	66.9	62.4	182	47	4
Rainbow Glen Road w/o Old Highway 395	35			3050	64.1	60.0	55.5	65.3	61.2	56.7	38	1	-11
0	0			0	-	-	-	-	-	-	-	-	-

	CNEL			
Summary	25 ft. from ROW		At ROW	
	Project	Cumulative	Project	Cumulative
Roadway/Segment	Increment	Increment	Increment	Increment
Mission Road w/o Live Oak Park Road	0.0	2.3	0.1	2.4
Mission Road e/o Live Oak Park Road	0.0	2.3	0.0	2.3
Old Highway 395 n/o Mission Road	0.9	3.5	0.8	3.4
Rainbow Glen Road w/o Old Highway 395	5.0	5.0	5.0	5.0
0	-	-	-	-

	% of ADT			
Vehicle Type	Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS Gopher Canyon

Existing													
	Speed	**Traffic Volumes**			**Leq**			**CNEL**			**Distance, Feet**		
Roadway/Segment	**MPH**	**AM**	**PM**	**ADT**	**ROW**	**25 Feet**	**100 Feet**	**ROW**	**25 Feet**	**100 Feet**	**60 CNEL**	**65 CNEL**	**70 CNEL**
Gopher Canyon Road w/o Project Access Road	35			14440	70.8	66.7	62.2	72.0	68.0	63.5	239	65	9
Gopher Canyon Road between Project Access Road and Vista V	35			14440	70.8	66.7	62.2	72.0	68.0	63.5	239	65	9
Gopher Canyon Road between Vista Valley Drive and Twin Oaks	35			15900	71.2	67.2	62.7	72.5	68.4	63.9	270	74	13
Gopher Canyon Road between Twin Oaks Valley Road and I-15 S	35			14030	70.7	66.6	62.1	71.9	67.8	63.3	233	63	9
0	0			0	-	-	-	-	-	-	-	-	-
Future No Action													
	Speed	**Traffic Volumes**			**Leq**			**CNEL**			**Distance, Feet**		
Roadway/Segment	**MPH**	**AM**	**PM**	**ADT**	**ROW**	**25 Feet**	**100 Feet**	**ROW**	**25 Feet**	**100 Feet**	**60 CNEL**	**65 CNEL**	**70 CNEL**
Gopher Canyon Road w/o Project Access Road	35			16530	71.4	67.3	62.8	72.6	68.5	64.0	277	77	13
Gopher Canyon Road between Project Access Road and Vista V	35			16630	71.4	67.4	62.8	72.6	68.6	64.1	277	77	13
Gopher Canyon Road between Vista Valley Drive and Twin Oaks	35			18170	71.8	67.7	63.2	73.0	69.0	64.4	305	85	16
Gopher Canyon Road between Twin Oaks Valley Road and I-15 S	35			16440	71.4	67.3	62.8	72.6	68.5	64.0	277	77	13
0	0			0	-	-	-	-	-	-	-	-	-
Future With Alternative													
	Speed	**Traffic Volumes**			**Leq**			**CNEL**			**Distance, Feet**		
Roadway/Segment	**MPH**	**AM**	**PM**	**ADT**	**ROW**	**25 Feet**	**100 Feet**	**ROW**	**25 Feet**	**100 Feet**	**60 CNEL**	**65 CNEL**	**70 CNEL**
Gopher Canyon Road w/o Project Access Road	35			18180	71.8	67.7	63.2	73.0	69.0	64.5	305	85	16
Gopher Canyon Road between Project Access Road and Vista V	35			19100	72.0	68.0	63.5	73.2	69.2	64.7	320	90	18
Gopher Canyon Road between Vista Valley Drive and Twin Oaks	35			20640	72.4	68.3	63.8	73.6	69.5	65.0	352	100	21
Gopher Canyon Road between Twin Oaks Valley Road and I-15 S	35			18910	72.0	67.9	63.4	73.2	69.1	64.6	320	90	18
0	0			0	-	-	-	-	-	-	-	-	-

	CNEL			
Summary	**25 ft. from ROW**		**At ROW**	
Roadway/Segment	**Project Increment**	**Cumulative Increment**	**Project Increment**	**Cumulative Increment**
Gopher Canyon Road w/o Project Access Road	0.5	1.0	0.4	1.0
Gopher Canyon Road between Project Access Road and Vista V	0.6	1.2	0.6	1.2
Gopher Canyon Road between Vista Valley Drive and Twin Oaks	0.5	1.1	0.6	1.1
Gopher Canyon Road between Twin Oaks Valley Road and I-15 S	0.6	1.3	0.6	1.3
0	-	-	-	-

	% of ADT			
Vehicle Type	**Day**	**Eve**	**Night**	**Sub total**
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS Merriam Mountain

Existing	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Deer Springs Road between Twin Oaks Valley Road and I-15 SB	35			16740	71.5	67.4	62.9	72.7	68.6	64.1	283	79	14
Mountain Meadow Road between Champagne Boulevard and Hig	40			7270	67.7	64.5	60.4	68.9	65.7	61.6	153	33	-5
Champagne Boulevard between Mountain Meadow Road and La	35			5270	66.4	62.4	57.9	67.7	63.6	59.1	79	14	-7
Lawrence Welk Drive between Champagne Boulevard and Lawre	35			200	52.2	48.2	43.7	53.4	49.4	44.9	-13	-15	-16
0	0			0	-	-	-	-	-	-	-	-	-

Future No Action	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Deer Springs Road between Twin Oaks Valley Road and I-15 SB	35			23050	72.9	68.8	64.3	74.1	70.0	65.5	397	115	25
Mountain Meadow Road between Champagne Boulevard and Hig	40			11020	69.5	66.3	62.2	70.7	67.5	63.4	243	61	4
Champagne Boulevard between Mountain Meadow Road and La	35			9610	69.1	65.0	60.5	70.3	66.2	61.7	156	38	1
Lawrence Welk Drive between Champagne Boulevard and Lawre	35			200	52.2	48.2	43.7	53.4	49.4	44.9	-13	-15	-16
0	0			0	-	-	-	-	-	-	-	-	-

Future With Alternative	Speed	Traffic Volumes			Leq			CNEL			Distance, Feet		
Roadway/Segment	MPH	AM	PM	ADT	ROW	25 Feet	100 Feet	ROW	25 Feet	100 Feet	60 CNEL	65 CNEL	70 CNEL
Deer Springs Road between Twin Oaks Valley Road and I-15 SB	35			23120	72.9	68.8	64.3	74.1	70.0	65.5	397	115	25
Mountain Meadow Road between Champagne Boulevard and Hig	40			11050	69.5	66.3	62.2	70.7	67.5	63.4	243	61	4
Champagne Boulevard between Mountain Meadow Road and La	35			11360	69.8	65.7	61.2	71.0	66.9	62.4	186	48	4
Lawrence Welk Drive between Champagne Boulevard and Lawre	35			2290	63.4	59.3	54.8	64.6	60.5	56.0	30	-1	-11
0	0			0	-	-	-	-	-	-	-	-	-

	CNEL			
Summary	25 ft. from ROW		At ROW	
Roadway/Segment	Project Increment	Cumulative Increment	Project Increment	Cumulative Increment
Deer Springs Road between Twin Oaks Valley Road and I-15 SB	0.0	1.4	0.0	1.4
Mountain Meadow Road between Champagne Boulevard and Hig	0.0	1.8	0.0	1.8
Champagne Boulevard between Mountain Meadow Road and La	0.7	3.3	0.7	3.3
Lawrence Welk Drive between Champagne Boulevard and Lawre	11.1	11.1	11.2	11.2
0	-	-	-	-

	% of ADT			
Vehicle Type	Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Project: Gregory Canyon EIS: East Otay Mesa Off-Site Alternative

Roadway/Segment	Speed MPH	Traffic Volumes AM	Traffic Volumes PM	Traffic Volumes ADT	Leq ROW	Leq 25 Feet	Leq 50 Feet	CNEL ROW	CNEL 25 Feet	CNEL 50 Feet	Distance, Feet 60 CNEL	Distance, Feet 65 CNEL	Distance, Feet 70 CNEL
Existing													
Siempre Viva Road between SR-905 NB Ramps and Paseo de la	45			26650	73.4	70.7	69.1	74.6	72.0	70.3	831	242	56
Siempre Viva Road between Paseo de las America and Michael F	40			9890	68.6	65.6	63.8	69.8	66.8	65.0	216	51	-1
Siempre Viva Road between Michael Faraday Drive and Enrico F	40			6440	66.7	63.7	62.0	67.9	64.9	63.2	131	24	-10
Siempre Viva Road e/o Michael Faraday Drive	30			830	57.4	53.3	51.2	58.6	54.5	52.4	-4	-12	-15
Siempre Viva Road to Access Road	25			0	-	-	-	-	-	-	-	-	-
Future No Action													
Siempre Viva Road between SR-905 NB Ramps and Paseo de la	45			51150	76.2	73.6	71.9	77.4	74.8	73.2	1611	489	134
Siempre Viva Road between Paseo de las America and Michael F	40			29950	73.4	70.4	68.6	74.6	71.6	69.9	703	205	48
Siempre Viva Road between Michael Faraday Drive and Enrico F	40			26650	72.9	69.9	68.1	74.1	71.1	69.4	624	180	40
Siempre Viva Road e/o Michael Faraday Drive	30			16270	70.3	66.2	64.1	71.5	67.4	65.4	211	56	7
Siempre Viva Road to Access Road	25			19600	69.5	65.4	63.4	70.7	66.7	64.6	173	44	3
Future With Alternative													
Siempre Viva Road between SR-905 NB Ramps and Paseo de la	45			51150	76.2	73.6	71.9	77.4	74.8	73.2	1611	489	134
Siempre Viva Road between Paseo de las America and Michael F	40			29950	73.4	70.4	68.6	74.6	71.6	69.9	703	205	48
Siempre Viva Road between Michael Faraday Drive and Enrico F	40			26650	72.9	69.9	68.1	74.1	71.1	69.4	624	180	40
Siempre Viva Road e/o Michael Faraday Drive	30			2290	70.3	66.2	64.1	71.5	67.4	65.4	211	56	7
Siempre Viva Road to Access Road	25			21154	69.8	65.8	63.7	71.1	67.0	64.9	191	49	5

CNEL

Summary Roadway/Segment	25 ft. from ROW Project Increment	25 ft. from ROW Cumulative Increment	At ROW Project Increment	At ROW Cumulative Increment
Siempre Viva Road between SR-905 NB Ramps and Paseo de la	0.0	2.8	0.0	2.8
Siempre Viva Road between Paseo de las America and Michael F	0.0	4.8	0.0	4.8
Siempre Viva Road between Michael Faraday Drive and Enrico F	0.0	6.2	0.0	6.2
Siempre Viva Road e/o Michael Faraday Drive	0.0	12.9	0.0	12.9
Siempre Viva Road to Access Road	0.3	-	0.4	-

Vehicle Type	% of ADT Day	Eve	Night	Sub total
Auto	77.6%	9.7%	9.7%	97.0%
Medium Truck	1.6%	0.2%	0.2%	2.0%
Heavy Truck	0.8%	0.1%	0.1%	1.0%
	80.0%	10.0%	10.0%	100.0%

Vibration Technical Report on Construction Blasting Operations at the Gregory Canyon Landfill Pala, California

Prepared for

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1.0 INTRODUCTION

1.1 SUMMARY

This vibration technical report addresses existing site conditions as well as potential impacts due to construction blasting activities at the proposed Gregory Canyon Landfill site adjacent to the San Diego First Aqueduct (pipelines 1 and 2).

Ambient ground velocity levels at the project site were found to average around 0.24 inches per second in the 25 Hertz (or Hz.) center frequency range and 0.14 inches per second in the 40 Hz. center frequency range at most monitoring locations. Maximum vibration velocities of 3.35 inches per second at 25 Hz. and 3.72 at 40 Hz. were found to occur at the aqueduct crossing along SR-76.

The damping factors and dynamic response of the aqueduct-soil system were experimentally determined using modal analysis methods. An average damping level of 4.24% (or 0.0021 per linear foot) was found to be prevalent in areas adjacent to the aqueduct. Low frequency modal activity (associated with rigid transverse motion of the portals and tunnel segments was found to occur around 18 to 22 Hz. Higher identified dynamic activity was associated with local motion of the portal itself.

Based upon this level of damping, the aqueduct-soil system was modeled as a viscously damped single-degree-of-freedom (or SDOF) mechanical system. The response was calculated for an arbitrary single velocity input (initial conditions) of 15.0 inches per second at a reference distance of 50.0 feet. The response curves (with an incorporated safety margin) indicate a minimum safe blasting distance of 165 feet for a pure 15.0 Hz. wave at this magnitude. The frequency content of the blast having been determined by two small test charge detonations at the landfill site. These distances form the zone of influence due to blasting interaction along the aqueduct alignment. Finally, the recommended open-face charge weight per delay to satisfy the above model was calculated to be 34 pounds.

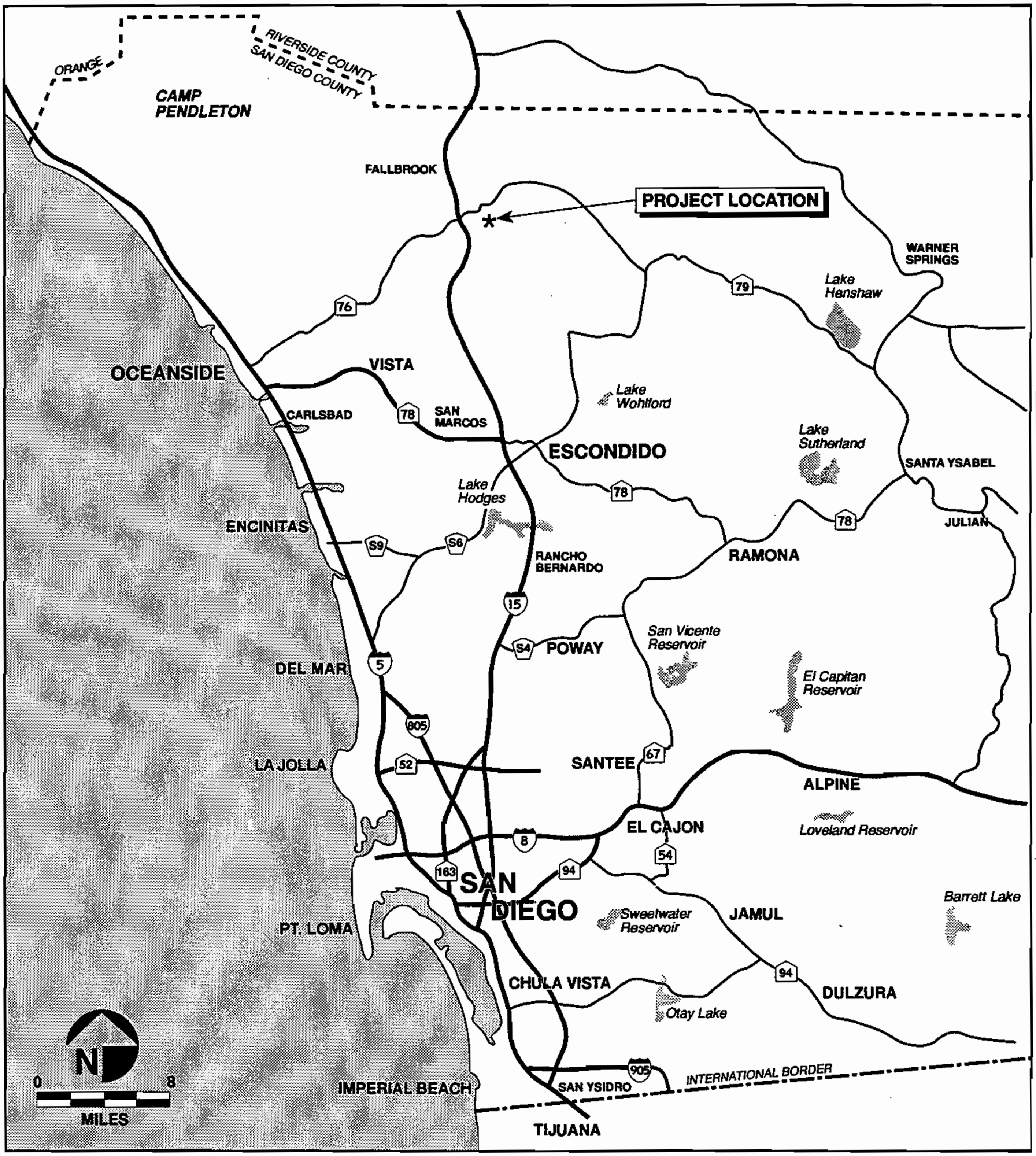
Given the definition of the zone of influence, impacts are expected if blasting occurs inside the influence zone for the respective frequency-maximum velocity pairs. No impacts are expected outside this zone. No impacts from associated blasting activities (vehicles, drilling, etc.) were indicated. Recommendations designed to reduce blasting impacts, and thus the influence zone size are presented at the end of this report.

1.2 Project Description

The proposed project consists of the construction, operation, and ultimate closure of a new Class III solid waste landfill at Gregory Canyon, located in northeastern San Diego County near the community of Pala, approximately three and one-half miles east of the I-15 and SR-76 intersection. The project area includes an access road and bridge, entrance facilities, administration and maintenance facilities, recycling facilities, and relocation of SDG&E power lines and the possible relocation of the San Diego First Aqueduct Pipelines 1 and 2. The proposed project is located on a 1,683 acre privately-owned site which is under a purchase option agreement with Gregory Canyon Ltd. The site consists largely of undisturbed steep canyon walls which flattens at the mouth of the canyon where it meets alluvial deposits of the San Luis Rey River Drainage.

The area occupies portions of Section 4 and 5 of Township 10 South and Sections 32 and 33 of Township 9 South of the County of San Diego, and is located on Range 2 west of the USGS 7.5' Pala Quadrangle. Elevations of the area range from 1,200 feet MSL at the head of the canyon to the south to 300 feet MSL at the mouth of the canyon adjacent to the San Luis Rey River. A prominent knoll extends into the river drainage on the west side of the canyon mouth. The regional location of the project site is shown in Figure 1.

Blasting is expected at the Gregory Canyon Landfill site since recent geologic surveys of the area indicate dense underlying rock structures with high shear velocities (Battle, 1995). Blasting is not expected to generate high air-borne overpressures. Vibration associated with blasting is dependent on the amount and type of blasting material and the depth of the charge below the surface. A large fraction of the energy of the blast is absorbed through a plastic deformation mechanism within the rock (i.e., fracturing of the rock) with the remainder of the energy being converted to heat, mechanical vibrations in the rock, and sound vibrations in the air. Vibrations emanating from a blast is generally characterized as being low frequency (i.e., less than 40 Hz.) with the dominant energy present below 20 Hz.



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Regional Location of Project Site

FIGURE **1**

1.3 INTRODUCTION AND THEORY

1.3.1 Resource Introduction

Vibration is generally defined as any oscillatory motion induced in a structure or mechanical device as a direct result of some type of input excitation. The object (either structure or machine) of interest typically has sufficient inertia so that by Newton's first law of motion, its rest state is one of zero vibration. Input excitation, generally in the form of an applied force or displacement, is the mechanism required to start some type of vibratory response.

Once an object begins to respond to an applied excitation, its natural tendency is to vibrate as some linear combination of its natural frequencies. A natural frequency is defined as the frequency at which an object will vibrate if set into motion and allowed to move freely. Any continuous system of particles (such as a building or motor assembly) will have an infinite number of natural frequencies, with each one adding to the overall response in a sea of ever-decreasing contributions. As the frequency of the excitation approaches one of the objects natural frequencies the magnitude of the objects vibratory response (e.g., displacement) increases until, when the two frequencies are exact, a condition known as resonance arises. At resonance the amplitude of the response of the object theoretically approaches infinity. The only natural mechanism available to temper the catastrophic effects of resonance is the objects own inherent level of damping.

Little is currently known about the actual physical mechanisms that produce damping in an object, although, a great deal is known about what effects it produces. Damping can be thought of as a type of 'drag' that is always present to some degree in a object and serves to remove energy from the vibrating system as it moves. Artificial damping is used routinely in mechanical devices and takes the form of shock absorbers, viscous isolation materials, and simple friction. In structures, damping is generally present within the material itself and hence is called 'material damping'. The cause of this damping is due to the interactions between the molecular lattice structures comprising the material.

The final inherent property of a vibrating system is its stiffness. The stiffness of a system is what allows an object to store the energy imparted to it through an excitation and redistribute it in the form of a vibration. Without some form of stiffness, an object simply will not vibrate. Mechanical forms of stiffness take the forms of springs while in a structural system the stiffness is inherent in the material itself.

Having now described the three major components of a vibratory system: mass, damping, and stiffness; the vibratory response of an object can be summarized in the form of the following equation relating these three terms to the applied force.

$$\mathbf{M}\ddot{x} + \mathbf{C}\dot{x} + \mathbf{K}x = \mathbf{F}(t) \qquad (1)$$

where,

$\mathbf{M}$ = mass of the object (or system of objects)
$\mathbf{C}$ = damping present in the object (or system of objects)
$\mathbf{K}$ = amount of stiffness present in the object (or system of objects)
$\mathbf{F}$ = time varying input excitation (typically force)

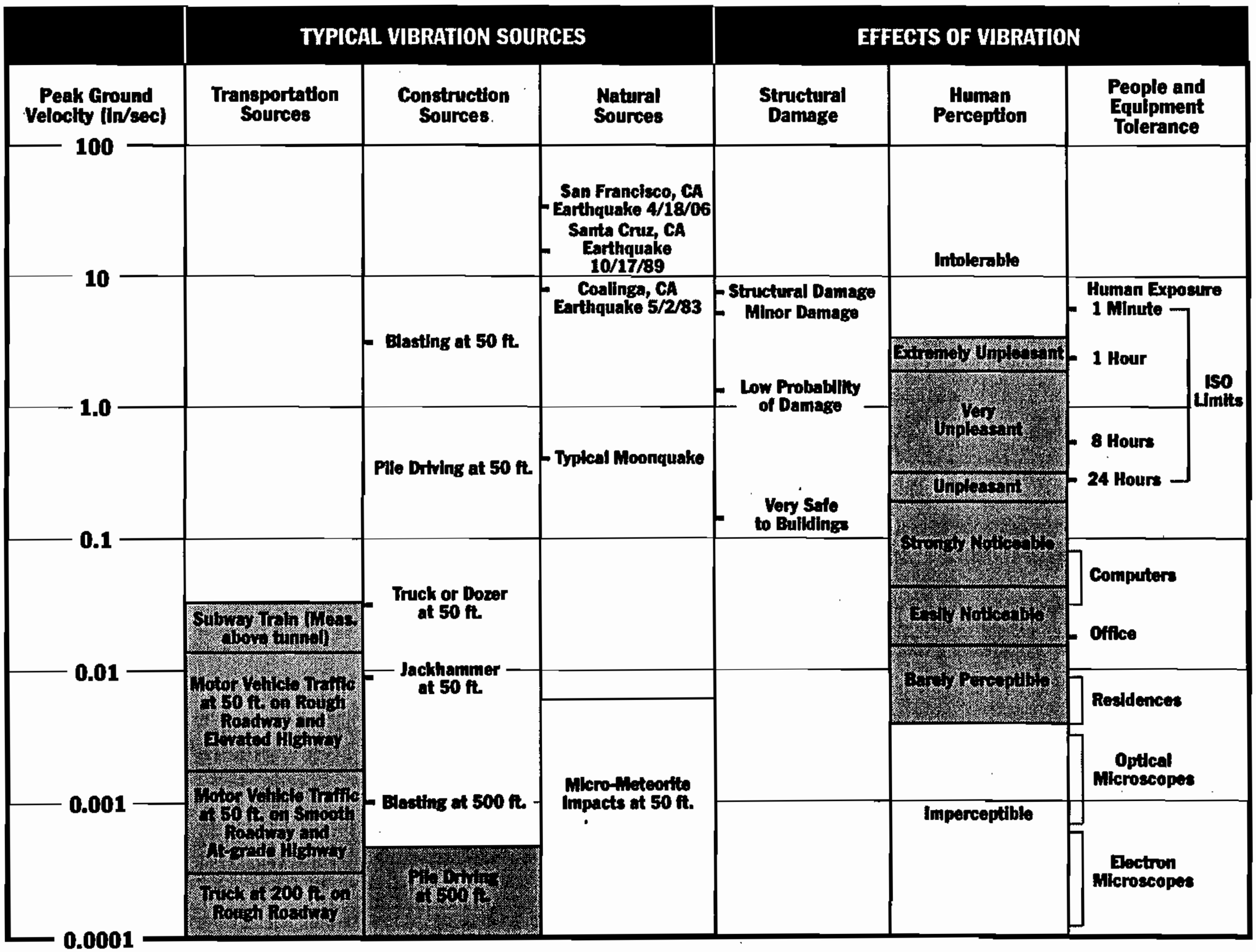
and,

$\ddot{x}$ = acceleration of the object (or point in the system)
$\dot{x}$ = velocity of the object (or point in the system)
x = displacement of the object (or point in the system)

In essence, the whole of vibration studies can be reduced to the solution of the above differential equation (i.e. solving for $\ddot{x}$, $\dot{x}$, or x). One important element becomes immediately apparent in equation 1; the mass (or inertial force) of a system is proportional to its acceleration, the damping (or viscous drag force) is proportional to the velocity, and the stiffness (spring force) is proportional to the displacement.

For most practical applications, induced mechanical or structural vibrations are a thing to be avoided since they are generally unwanted and according to their magnitude can produce physical discomfort, misalignment of equipment, loosening of mechanical fasteners, product defects, and skewed research results. In the case where the excitation frequency is close to resonance or of sufficient magnitude (such as in an earthquake), severe structural damage can occur.

Figure 2 provides a tabular picture of typical vibration sources and their effects on buildings, equipment, and humans. The peak ground velocity produced by various disturbances is given throughout a wide spectrum ranging from the infinitesimal to the severe. Figure 2 is a compilation from various sources (textbooks, research papers, international standards, and past demonstrated engineering tolerance levels).



SOURCE: Amick, Nugent, Tavares 1992-1995.

FIGURE 2

Typical Vibration Sources and Sensitivities

Vibrations are commonly measured using a device known as an accelerometer. This device consists of a small piezoelectric crystal shaped in such a fashion so as to produce a small electrical charge when it is vibrated. This electrical charge is then transmitted via a cable assembly into a spectrum analyzer which displays the frequency content and magnitude of the electrical signal. These signals are numerical solutions to the above differential equation (equation 1). By calibrating the accelerometer's output signal, the electrical signal then becomes a direct representation of the vibration present and hence indicates the acceleration, velocity, and/or displacement present at the point of interest.

1.3.2 Theory of the General Problem

General Problem Description

The study of wave phenomenon produced by a blasting event is identical to the study of wave motion produced by earthquakes and hence falls under the general classification of seismology. The general class of problems seeks to predict the vibratory response (at a point) due to some type of excitation (either blasting or earthquakes). The problem statement is presented briefly below. The solution strategy employed in this technical report will seek to model the wave response due to blasting in a simpler and more computationally efficient manner with negligible loss in accuracy for the type of problem examined.

Past observational experience indicates that the constitutive relationship (stress-strain relationship) of rocks and hard packed soils for infinitesimal strains and seismic frequencies is highly elastic so that Hooke's law is applicable for seismic propagation theory to a high degree of approximation.

Consider a large solid body made up of regions which are individually homogeneous and isotropic. Let an infinitesimal element of the body be in mechanical and thermodynamic equilibrium. Applying Newton's second law to all forces applied to the element and noting that force equilibrium is maintained via Hooke's law leads one to the following vector equation of motion. Namely,

$$\rho \frac{\partial ^{2}\bar{s}}{\partial t} = (k + \frac{1}{3}\mu)\ grad\,\theta + \mu \nabla^{2}\bar{s} \tag{2}$$

In the above equation $\bar{s}$ is the particle displacement vector, $\theta = div\,\bar{s}$ is the dilation of the element, ρ is the density of the element, μ is the element's rigidity, and k is the element's bulk modulus.

A direct closed-form solution of equation 2 does not exist. A method known as *separation of variables* has traditionally been applied to this equation to uncouple the particle displacement vector $\bar{s}$ from the elements dilation $\theta = div\,\bar{s}$ and treat each phenomenum separately. Thus the simpler, but computationally intensive relationships are,

$$\nabla^2\theta = \frac{\rho}{k + \frac{4}{3}\mu} \cdot \frac{\partial^2\theta}{\partial t^2} \qquad (3)$$

$$\nabla^2\bar{\psi} = \frac{\rho}{\mu} \cdot \frac{\partial^2\psi}{\partial t^2} \qquad (4)$$

where, $\bar{\psi} = curl\,\bar{s}$.

Equation 3 establishes the existence of irrotational waves (sometimes called dilational waves) which travel at a local velocity of $\sqrt{(k + 4/3(\mu/\rho)}$, whereas equation 4 indicates the existence of equivoluminal waves (sometimes called shear or distortional waves) traveling at a velocity of $\sqrt{\mu/\rho}$. Since the first velocity is always greater than the second, irrotational waves arrive first and are designated in the geologic nomenclature with the symbol P (for primus or primary), while the equivoluminal waves coming in second are designated as S (for secundus or secondary). Finally, it should be noted that P waves are orthogonal (perpendicular) to the advancing wavefront while S waves are parallel to the wavefront.

Of the two types of waves generated during a blast, only the S waves are of principal concern since they are more likely to cause damage. The P waves, although traveling farther due their dependence on the bulk modulus k in the expression $\sqrt{(k + 4/3(\mu/\rho)}$, decay rapidly due to spherical spreading losses and hence transfer less energy to an affected structure. These waves decay at a rate approximately yielding a 50% drop in amplitude per doubling of distance from source to receiver. Thus, for the purposes of construction blasting along the First Aqueduct, we will confine our analysis to predicting the decay distance of transverse waves.

Report Solution Strategy

The methodology employed in this technical report will be to model the combined aqueduct-soil system as a SDOF viscously damped harmonic oscillator subjected to an initial velocity input. The classification of dynamic soil behavior (especially damping) as a small-strain viscously damped medium is well documented (Campella, et. al., 1994). Since we are only interested in the first transverse (shear or up-down) mode of the combined aqueduct-soil system, the method of approximating the behavior due to blast excitation as a SDOF mechanical system is valid to within an acceptable degree of accuracy.

Considering now the solution to the underdamped free vibration of a system described by equation 1 with linear (small-strain) viscous damping and subjected to initial displacement and velocity u_o and $\dot{u}_o$,

$$u(t) = e^{-\varsigma \omega_n t}\left(u_o \cos\omega_d t + \frac{\dot{u}_o + \varsigma \omega_n u_o}{\omega_d} \right)\sin\omega_d t \qquad (5)$$

where,

$u(t)$ is the displacement of the system as a function of time,

ς is the small-strain material damping coefficient,

ω_n is the undamped circular natural frequency of the aqueduct-soil system, and,

ω_d is the damped circular natural frequency of the system $= \omega_n \sqrt{1-\varsigma^2}$

For this type of system, ς is always less than 1.0. Taking the derivative of equation 5 with respect to time t, and assuming no initial displacement u_o, gives the following simplified expression describing the motion of our system.

$$\dot{u}(t) = -\varsigma \omega_n \dot{u}_o e^{-\varsigma \omega_n t} \cos\omega_d t \qquad (6)$$

Finally, letting the damping ratio ς be a continuous function of spatial position x yields,

$$\dot{u}(x,t) = -\varsigma(x)\omega_n \dot{u}_o e^{-\varsigma(x)\omega_n t} \cos\overline{\omega_d} t \qquad (7)$$

where,

$$\overline{\omega_d} = \omega_n \sqrt{1-\varsigma(x)^2}$$

Since the aqueduct-soil system is assumed to be linearly elastic (as was the case for equation 2) general reciprocity rules apply. Equation 7 describes the spatial-time response of an initial velocity jump applied to the aqueduct-soil system measured at some distance x away from the portal, or conversely, the response at the portal when a velocity jump (blasting event) takes place at some distance x away. The only task remaining is the quantification of the aqueduct-soil damping ratio ς, which is described shortly.

1.4 Applicable Engineering Standards

County of San Diego Vibration Standards

Currently there are no regulations regarding vibration exceedance criteria for the County of San Diego, nor are there any specific zoning ordinances pertaining to admissible site-specific levels. Typically, a specific structural design is based upon prudent engineering judgment, analytical verification, and coherence with a uniform building code.

U.S. Bureau of Mines RI 8507 Blasting Criteria

The U.S. Bureau of Mines in its report RI 8507, "Structure Response and Damage Produced by Ground Vibrations from Surface Blasting" has identified acceptable maximum transverse ground velocity levels. This criteria, which is similar to the earlier Bureau of Mines Bulletin 656 Report sets the maximum peak particle velocity as a function of frequency. The results are summarized in Table 1 below. It has been shown by the Bureau of Mines that these vibratory excitation levels would produce negligible effects (displacement, fatigue, and damage) in conventionally constructed structures (i.e., structures built within the past 100 years).

Table 1

US BUREAU OF MINES RI 8507 STANDARDS

Blast Frequency Component (*f*) (Hz.)	Maximum Allowable Peak Particle Velocity (inches per second)
2.5 to 10.0	0.05
11.0 to 40.0	0.05 x *f**
> 40.0	2.0

*: The maximum allowable peak particle velocity for the range of frequencies between 11.0 and 40.0 Hz. is limited to the value of 0.05 times the dominant blast frequency. Thus for example, if the blast frequency was 30.0 Hz., the maximum allowable particle velocity at the monitoring point would be 1.5 inches per second.

It is often difficult to quantify the frequency characteristics of a blasting event and as such the above RI 8507 standard reduces to the Bulletin 656 standard of 2.0 inches per second total transverse displacement when an assumed blasting frequency of 40 Hz. is used.

Finally, the San Diego County Water Authority, which is in charge of the operation and maintenance of the First Aqueduct system, has adopted in its design procedure manual (02229-3 Feb. 1995) the blasting criteria provided in the RI 8507 report. This vibration criteria will be used as the significance criteria (and hence the basis for zone of influence calculations) in this technical report.

ISO 4866 and 7626-(1,2) Tolerance Requirements

Typical tolerance requirements pertaining to vibration effects on machines and structures are generally a function of the objects construction, projected service life, materials used, design strategy, operational environment, and resilience to unexpected types of loading. For buildings in particular, these factors (and many more) contribute to the overall service life of the structure. A complete list of the material, strength, loading, kinematics, soil analysis, and construction methods would fill an entire engineering curriculum, and are beyond the scope of this report.

The International Organization for Standardization (or ISO), however, has defined several general standards based upon past engineering experience for the determination and analysis of mechanical and structural vibration. ISO standards 4866, and 7626 parts 1 and 2 will be used as the functional basis of experimental analysis within this report.

2.0 APPARATUS AND PROCEDURE

2.1 Testing Methodology

The determination of the existing vibratory environment of the Gregory Canyon project area consisted of two phases. First, the ambient vibration level was determined at 10 monitoring locations (tunnel portals) along the First Aqueduct alignment. Vibratory levels of displacement, velocity, and acceleration were gathered at each instrumentation point. These vibration monitoring locations (GF's) are shown graphically in Figure 3.

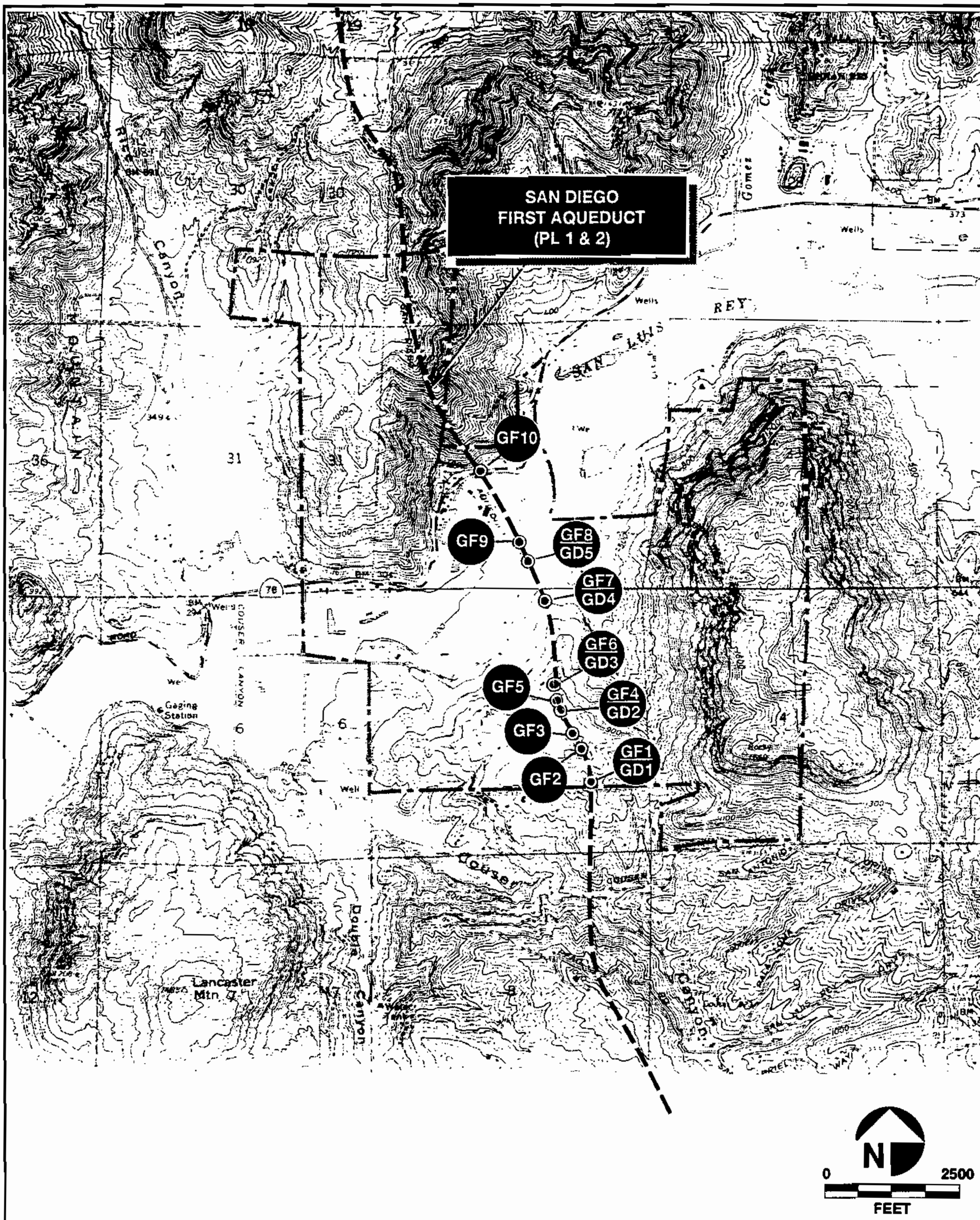
Second, data for the determination of the amount of aqueduct-soil damping as a function of frequency was gathered at 5 locations (tunnel portals) along the First Aqueduct alignment. A modal impact method was employed to apply sufficient input excitation (approximately 400-800 pounds of force) for the extraction of frequency response and coherence functions. The five damping estimation locations (GD's) are also shown graphically in Figure 3.

2.2 FREE VIBRATION TEST SETUP

Experimental ground borne free vibration data was gathered using a Larson Davis Model 2900 ANSI Type 1 Spectrum Analyzer. A single channel input feed was provided to the analyzer from an ICP (Integrated Circuit Piezoelectric) accelerometer. The accelerometer used had maximum response below 5.0 KHz. The test setup is shown in Figure 4, Part A, with the hammer and force signal on the left part of the figure removed.

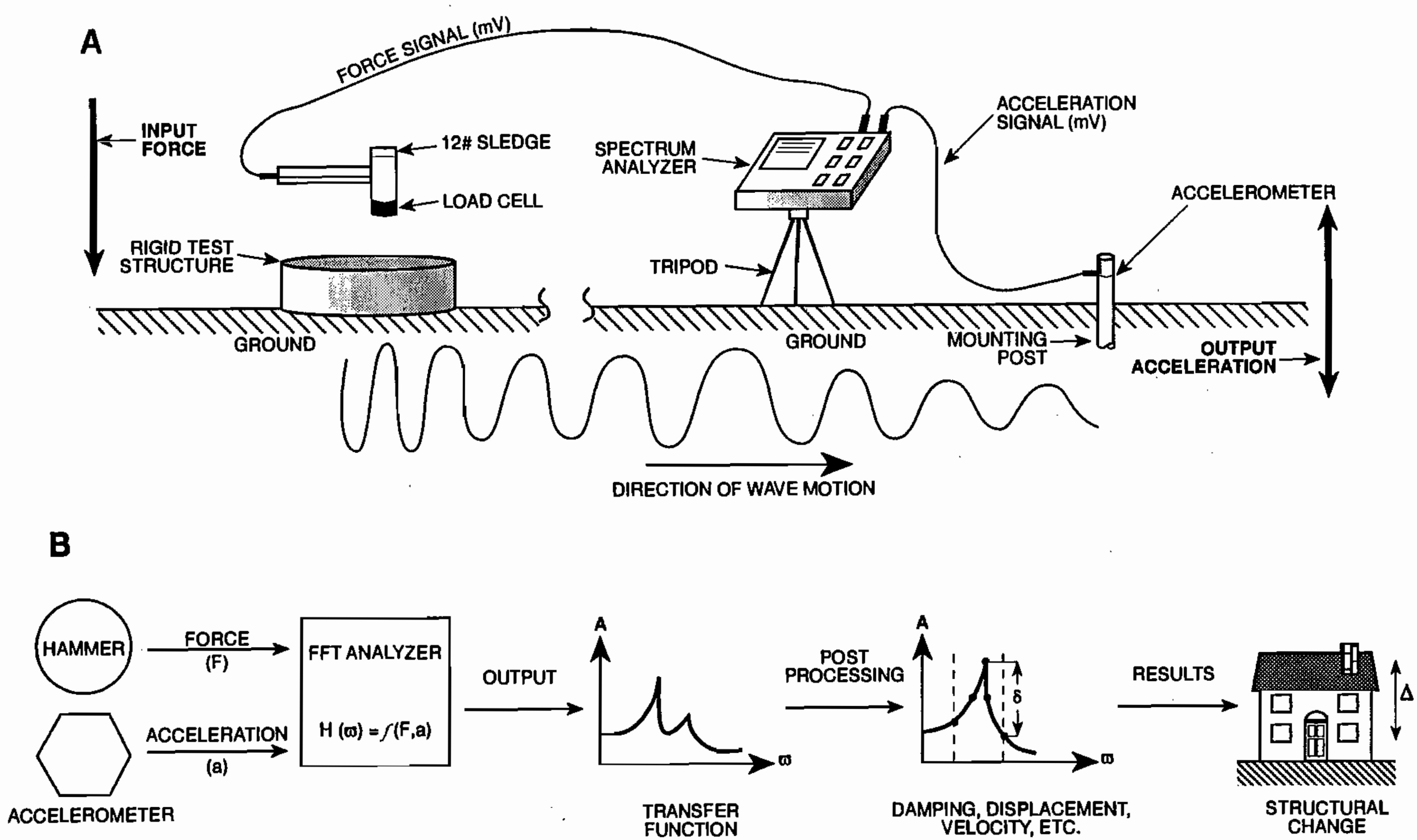
For the test setup, a metallic mounting post (rod) 12 inches in length was inserted into the ground at least 6 inches until determined by the experimenter to be firmly in place. Care was taken to ensure that the rod was vertical and perpendicular to the ground surface. The ICP accelerometer was mounted to the rod using a magnetic base. Output voltage proportional to the acceleration was fed through a charge amplifier and then a shielded cable to the spectrum analyzer for recording. The cable length used was at least 100 feet to ensure adequate isolation of the experimenter and the monitoring location.

A series of 15- minute spectral measurements third-octave band measurements were taken to determine the ground acceleration, velocity, and displacement. The spectrum analyzer



Ambient Vibration and Damping Parameter
Extraction/Monitoring Locations

FIGURE
3



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(A) Ground Transmissibility Test Setup/
(B) Vibration Solution Schematic

FIGURE 4

was calibrated using the accelerometer calibration data. All equipment used was within the valid calibration period.

2.3 Damping Estimation Test Setup

The relative amount of damping present at the five testing sites was determined using a procedure not unlike that used during the free vibration tests. Referring to Figure 4, Part A, we see the entire test setup. This two channel test required one channel (typically channel 2) to take its input from the same ICP accelerometer as during the free vibration measurement. The second channel (typically channel 1) obtained its input from a 12-pound calibrated modal sledge hammer. For the type of testing undertaken, the sledge hammer impacted the upper exposed part of the aqueduct portal which acted to transfer the energy through the portal and into the ground. The accelerometer was positioned at a distance of 20 feet from the edge of the portal housing. The results measured were therefore for the combined aqueduct-soil system.

Output voltage proportional to the acceleration was fed through a charge amplifier and then a shielded cable to the spectrum analyzer through channel 2. An output voltage proportional to the applied force was fed into channel 1 through a shielded cable. A total of 25 hammer blows was applied to the portal during each data run to minimize sampling error and input variance. The procedure was repeated three times using a base frequency band of 154.68 Hz. with 400 lines of resolution (or 0.3867 Hz. per division). The solution strategy used by the analyzer is shown in Figure 4, Part B. Here, force input from the hammer and acceleration input from the accelerometer are combined to create a single vibratory measure called the transfer function (or frequency response function). This transfer function is saved for later recall during the post processing phase where vibratory parameters of interest (usually frequency and damping) are determined and the results plotted. The spectrum analyzer was calibrated using the accelerometer and modal hammer calibration data.

2.4 Test Blast Setup

A exploratory blasting regime was conducted at the Gregory Canyon site on February 23, 1996. Two test blasts, each consisting of approximately 30 pounds of ANFO (Ammonium Nitrate - Fuel Oil), were detonated in test holes located along a dirt access road adjacent to the proposed landfill site. Each hole was 25 feet in depth so as to correspond to the approximate depth of the First Aqueduct alignment. The two blast holes were placed 25 feet apart with the closest hole located approximately 600 feet from the closest aqueduct portal (portal number 1956+48.31, test point GF 7). Figure 5 shows the test blast locations with respect to the current aqueduct alignment. The blasting was performed by M.J. Baxter Drilling Company (State License No. 309281) with proper notification being given to all interested parties via Dig Alert Ticket number 269445.

An instrumentation point was placed at 100 feet from the closest hole or 125 feet from the farthest hole along the dirt access road. Shot number one occurred at the farthest hole (125 feet away) while shot number two occurred at the closest hole (100 feet away). Ground borne blast vibration data was gathered using a Larson Davis Model 2900 ANSI Type 1 Spectrum Analyzer. The accelerometer used had maximum response below 5.0 KHz. and a full dynamic range to +/- 50 g's (1g = 32.2 ft/sec/sec) in order to avoid overloads or possible internal damage due to the sharp peak of the blast response. In addition, a Nomis 5000 strong-motion seismograph was placed at aqueduct portal number 1956+48.31 to ascertain seismic velocity levels at the aqueduct due to the blasting events.

3.0 FINDINGS

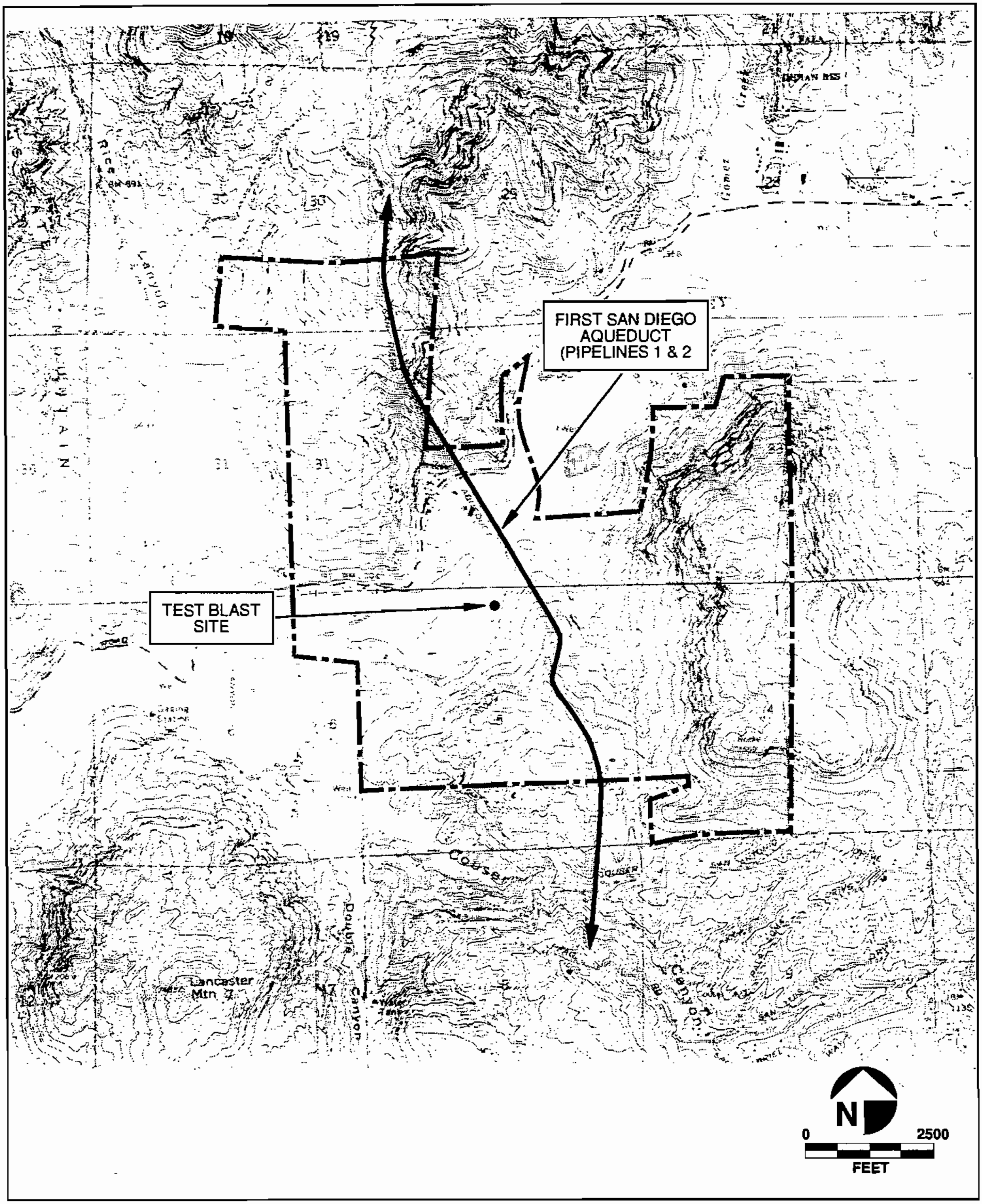
3.1 Existing Vibratory Environment

3.1.1 Geologic Site Conditions

Gregory Canyon is located in the San Diego Hydrologic Basin which occupies approximately 3,900 square miles of San Diego, Orange, and Riverside Counties in southwestern California. This hydrologic basin lies within the Peninsular Ranges province of California.

Bedrock within Gregory Canyon consists of the Bonsall Tonalite and Indian Mountain Leucogranodiorite (Woodward-Clyde, 1995). Additionally, localized metamorphosed sedimentary and volcanic rocks, inclusions, and lenticular banding have been mapped near the contact between the Bonsall Tonalite and the Indian Mountain Leucogranodiorite.

A metamorphic rock unit of probable Jurassic Age underlies the eastern slope of Gregory Canyon. These rocks are composed of schist, gneiss, and amphibolite of probable sedimentary and volcanic origin. The contact between the metamorphic rocks and Bonsall



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Location of Test Blast Site

FIGURE

5

Tonalite is probably gradational and concealed by colluvium. The First Aqueduct alignment passes through the colluvium above these rock layers and hence experiences no direct interface with these rocks.

3.1.2 Vibration Results

The post processed vibration data is presented in three sections corresponding to: 1) the free vibration results, 2) the extracted damping levels from the modal data, and 3) the frequency-based zones of influence due to the construction blasting operations.

Free Vibration Results

The free vibration results for the 10 monitoring locations (GF 1 through 10) are presented in Appendix A. Results are shown for the measured acceleration, velocity, and displacement over each 15- minute interval. Each monitoring location has three representative graphs depicting the equivalent or average (Leq) level, the minimum measured level (Lmin), and the maximum experienced level (Lmax). The measured levels at each monitoring location within the blasting frequency range are shown below in Table 2.

Ambient ground velocity levels at the project site were found to average around 0.24 inches per second in the 25 Hz. center frequency range and 0.14 inches per second in the 40 Hz. center frequency range at most monitoring locations. Maximum vibration velocities of 3.35 inches per second at 25 Hz. and 3.72 at 40 Hz. were found to occur along SR-76 which was the most active location measured.

Finally, it should be noted that there is a slight amount of seismicity at the site owing to the areas close proximity to the Elsinore Fault Zone (Figure 6). The Elsinore Fault passes roughly four miles to the north of the project alignment and has in recent times produced area earthquakes with Richter magnitudes of 4.0 to 4.9. It is not expected that seismicity due to this fault biased the data to any level of significance.

Extracted Damping Levels

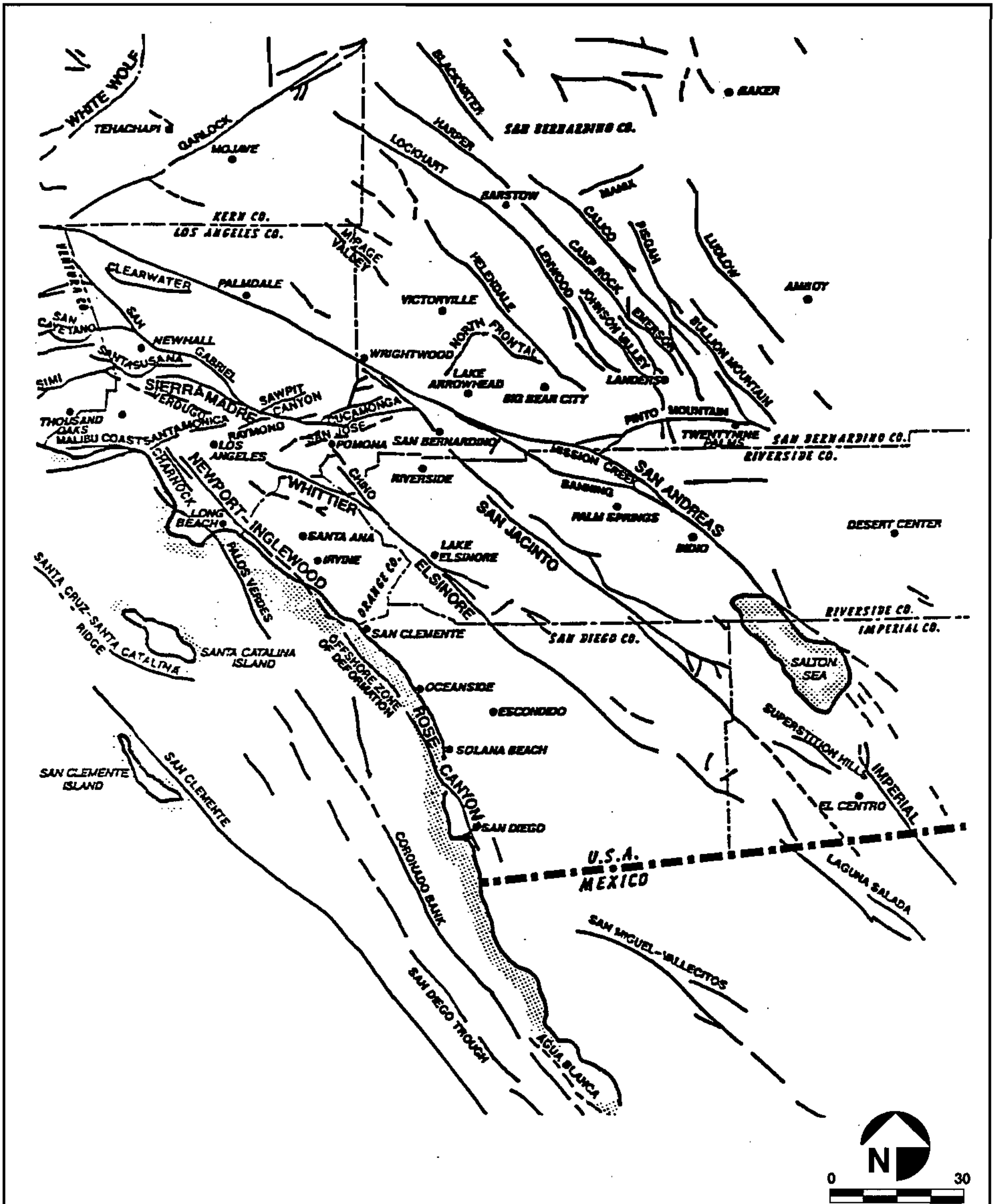
Relative damping levels were extracted using modal analysis and the Half-Power-Point-Method (Ewins, 1986). This method utilizes the Modal Force Hammer and provides soil

Table 2

SELECTED AMBIENT VIBRATION LEVELS ALONG SAN DIEGO FIRST AQUEDUCT ALIGNMENT

	15- Minute Average Levels (Leq)			Minimum Measured Levels (Lmin)			Maximum Measured Levels (Lmax)		
GF#	Acceleration (in/sec/sec)	Velocity (in/sec)	Displacement (in)	Acceleration (in/sec/sec)	Velocity (in/sec)	Displacement (in)	Acceleration (in/sec/sec)	Velocity (in/sec)	Displacement (in)
25 Hz. Octave Band Results									
1	36.8395	0.2345	0.0015	7.6969	0.0490	0.0003	85.3716	0.5435	0.0035
2	36.8395	0.2345	0.0015	7.8761	0.0501	0.0003	86.3602	0.5498	0.0035
3	36.8395	0.2345	0.0015	8.2473	0.0525	0.0003	100.3029	0.6385	0.0041
4	36.8395	0.2345	0.0015	7.3504	0.0468	0.0003	116.4967	0.7416	0.0047
5	36.8395	0.2345	0.0015	6.7813	0.0432	0.0003	91.4773	0.5824	0.0037
6	37.2661	0.2372	0.0015	8.5372	0.0543	0.0003	94.6920	0.6028	0.0038
7	35.5888	0.2266	0.0014	6.2562	0.0398	0.0003	111.2535	0.7083	0.0045
8	35.1814	0.2240	0.0014	8.1529	0.0519	0.0003	101.4644	0.6459	0.0041
9	35.1814	0.2240	0.0014	7.9673	0.0507	0.0003	93.6081	0.5959	0.0038
10	56.4045	0.3591	0.0023	6.4020	0.0408	0.0003	526.3971	3.3511	0.0213
40 Hz. Octave Band Results									
1	33.9871	0.1352	0.0005	9.1477	0.0364	0.0001	83.4283	0.3320	0.0013
2	35.1814	0.1400	0.0006	10.6246	0.0423	0.0002	81.5293	0.3244	0.0013
3	34.7787	0.1384	0.0006	9.1477	0.0364	0.0001	79.6734	0.3170	0.0013
4	35.1814	0.1400	0.0006	10.6246	0.0423	0.0002	85.3716	0.3397	0.0014
5	34.7787	0.1384	0.0006	10.3828	0.0413	0.0002	75.2166	0.2993	0.0012
6	35.1814	0.1400	0.0006	10.5030	0.0418	0.0002	81.5293	0.3244	0.0013
7	33.2134	0.1322	0.0005	9.0430	0.0360	0.0001	80.5960	0.3207	0.0013
8	33.2134	0.1322	0.0005	8.1529	0.0324	0.0001	87.3602	0.3476	0.0014
9	32.8332	0.1306	0.0005	9.3608	0.0372	0.0001	73.5044	0.2925	0.0012
10	67.0368	0.2667	0.0011	10.6246	0.0423	0.0002	936.0811	3.7245	0.0148

Free Vibration Monitoring Locations (GF#): GF 1: 2080+63.50, GF 2: 2072+95.52, GF 3: 2067+01.24, GF 4: 2061+93.21, GF 5: 1973+39.51, GF 6: 1967+53.39, GF 7: 1956+48.31, GF 8: 1950+51.93, GF 9: 1945+48.40, GF 10: Along aqueduct crossing of SR-76 at a distance of 20 feet from roadway centerline.



SOURCE: Ninyo & Moore 1994

OGDEN

Fault Location Map

FIGURE

6

damping information as a function of frequency. The frequency response characteristics obtained for the five damping estimation locations (GD's) are shown in Appendix B. The maximum frequency considered was 154.68 Hz. These graphs show how the ground behaved dynamically when subjected to a sharp impact force. These peaks are termed a "response signature" because they uniquely identify the area tested.

The Half-Power-Point-Method attempts to calculate the relative amount of damping present in a particular mode (peak of the response signature) by examining the "sharpness" of the individual peaks. The sharper the peak, the smaller the amount of damping present. They appear as quantum lines since damping can only be estimated where a mode exists.

There are two graphs associated with Appendix B. The first shows the normalized modal (or frequency) response spectrum of the aqueduct-soil system. The peaks in the graph indicate frequency regions where dynamic response is indicated. It is suspected that the lower frequencies (below approximately 25 Hz.) correspond to motion of the aqueduct-soil system and thus should be avoided during blasting. The higher frequencies are associated with local "ringing" of the aqueduct portal and do not constitute a concern from a blasting perspective.

The second graph shows the amount of measured damping (damping ratio, or percent of critical damping) at each of the resonances shown in the first graph. As can be seen larger damping appears at the lowest frequencies and is attributed to coloumbic damping (or dry friction damping) associated with the aqueduct-soil interaction. Frequencies above this drop markedly in damping only to increase as a function of excitation frequency. This is generally attributed with material (soil) damping.

The average damping levels are shown below in Table 3 and reflect the combined aqueduct-soil interaction levels.

Table 3

EXTRACTED DAMPING LEVELS ALONG FIRST AQUEDUCT ALIGNMENT

Test Location	Percent of Critical Damping Level ζ (%)	Separation Distance of Excitation and Receiver Points	Damping Level per Linear Foot ζ / ft
GD 1	4.21	20 feet	0.0021
GD 2	4.28	20 feet	0.0021
GD 3	4.08	20 feet	0.0020
GD 4	4.35	20 feet	0.0021
GD 5	4.28	20 feet	0.0021

Notes:

- Caleulated as average modal damping in experimental frequeney range of 0.00 to 154.68 Hz.
- Includes rigid-body aqueduct-soil interaction.

The results show that a damping ratio of roughly 4.24 percent was present at the five test locations. This level is consistent with the surface composition (to the depth of the aqueduct) of this area which is unconsolidated and readily dampens vibratory energy.

Test Blast Results

The results of the test blast are shown in Appendix C. Dominant ground motion levels were recorded within the 15 Hertz range. For the purposes of later analysis, this frequency will be assumed to be the dominant response frequency from which to determine significance due to blasting operations.

It can also be seen from the figures given in Appendix C that large ground vibration levels are possible due to confined blasting operations. For shot number two which occurred 100 feet from the instrumentation point, ground velocity levels reached slightly over 14 inches per second (peak motion). From the Du Pont Blaster's Handbook (1977) a prediction of approximately 1.53 inches per second would be expected if this were an open-face blast. Since the test blast was a confined blast, magnification levels of over 9 times those predicted for an equivalent open-faced blast were recorded. This is to be expected, since without a free face to provide relief, all explosive energy from the test blasts went into either plastic deformation of the soil around the charge or into groundborne vibration.

Finally, surface vibration levels recorded by the seismograph located at the nearest aqueduct portal indicated ground vibration levels of 0.13 and 0.11 at approximately 18 Hertz for the two shots respectively. These levels were far below those set by the RI 8507 threshold standards.

3.2 Construction Blasting Zone of Influence

The projected construction blasting zones of influence are based upon assumed peak vibration levels produced by similar operations (Vibra-Tech Engineers, Syar Lake Herman Quarry, 1988) and the amount of damping present at the Gregory Canyon Landfill site. The assumed level was taken as an instantaneous 15.0 inch per second impulse at a reference distance of 50 feet. Nominal attenuation distance is calculated as that distance where the vibration levels drop below a level of significance. For this analysis, the level of significance will be defined according to the Bureau of Mines RI 8507 frequency dependent standard.

The graphical results of the modeling are shown in Appendix D. Table 4 shows the minimum predicted modeling distance (Minimum Blast Distance from Aqueduct for Compliance) and gives a measure of the linear distance required to meet the Bureau of Mines RI 8507 standards. The last column of Table 4 (Recommended Minimum Blasting Distance from Aqueduct) incorporates a 1.5 factor of safety to account for experimental and construction blasting errors. For the purposes on impact determination, the 0.25 second blast decay curve (from Appendix D) will be taken as the response curve of choice. Hence, this analysis represents a worst-case analysis.

Table 4

RECOMMENDED MINIMUM ALLOWABLE BLASTING LIMITS

Primary Blast Frequency Content	Bureau of Mines RI 8507 Maximum Allowables	Minimum Blast Distance from Aqueduct for Compliance	Recommended Minimum Blasting Distance from Aqueduct (MS=1.5)
5 Hz.	0.05 in/sec	> 500 feet	> 750 feet
10 Hz.	0.05 in/sec	263 feet	395 feet
15 Hz.	0.75 in/sec	110 feet	165 feet
20 Hz.	1.0 in/sec	94 feet	141 feet
30 Hz.	1.5 in/sec	91 feet	137 feet
40 Hz.	2.0 in/sec	88 feet	132 feet

Notes:

- Minimum blast distance based upon a maximum recordable instantaneous ground disturbance of 15.0 inches/second PPV measured at a reference distance of 50.0 feet from the detonation point.
- A frequency independent small-strain material damping ratio of 0.0021 per foot was used and is based upon empirical measurements. This level accounts for local aqueduct-soil interaction.
- Decay curves based upon a 0.25 second wave decay rate.
- Values given are for open-face blasting only. Charges fired with a high degree of confinement, such as in presplit blasting, generate peak particle velocity levels up to 10 times greater than those predicted. Blasting done for opening holes should use significantly larger blast distances or correspondingly smaller charges.

As can be seen from the above table, low frequency waves (below 10 Hz.) have the lowest allowable threshold, and by their very nature damp out more slowly and convey more energy. A minimum recommended blast distance of greater than 750 feet would be required to mitigate a 15.0 inch per second, pure 5 Hz. impulse recorded at 50 feet. This distance drops to slightly over 130 feet for a pure 40 Hz. wave.

Finally, from the experimental test blasts it was determined that the principal frequency response of the soil occurred at approximately 15 Hertz. From Table 4 it can be seen that for a groundborne vibrational wave with a 15 Hertz primary component, the distance traveled by the wave will be 165 feet before diminishing to a level of 0.75 inches per second (as set by the RI 8507 standard). From the Du Pont Blaster's Handbook one can calculate the open face maximum amount of explosives per 8 millisecond delay as being 34 pounds. Confined blasts should be scaled down by approximately a factor of 9 (approximately 4 pounds of explosive per 8 millisecond delay) as identified during the test blasting.

4.0 CONCLUSIONS

The following conclusions can be drawn based upon the experimental field data and the blasting analysis.

4.1 Blasting Effects

From the numerical analysis:

1. Significant portal-ground interaction was found in the frequency range of 18 to 22 Hz. This activity, which was highly damped and possibly coloumbic in nature, indicates a frequency region where blasting should be avoided, if possible.

2. Higher modal activity (above 40 Hz.) could be associated with local "ringing" of the portal structure and thus should not pose an impact.

3. The average damping level (including aqueduct-soil interaction) was 4.24 percent.

4. As a worst case, a 5 Hz. blast wave would require 750 feet to decay to an acceptable tolerance level.

5. As a best case, a 40 Hz. blast wave would require 132 feet to decay to an acceptable tolerance level.

6. Since the dominant frequency present during test blasting was approximately 15 Hz, the calculated decay distance of 165 feet should apply. The recommended charge weight for this condition would be 34 pounds per 8 millisecond (minimum) delay.

4.2 Traffic and Associated Activities

From the field survey:

1. Ambient ground velocity levels at the project site were found to average around 0.24 inches per second in the 25 Hertz (or Hz.) center frequency range and 0.14 inches per second in the 40 Hz. center frequency range at most monitoring locations.

2. Maximum vibration velocities of 3.35 inches per second at 25 Hz. and 3.72 at 40 Hz. were found to occur along SR-76. The dominant vehicles observed were heavy- to mid-sized trucks.

3. Peak ground response levels produced by confined blasting was seen to generate significantly higher vibration levels than those expected during open-face landfill excavation. This was to be expected. No impacts are expected provided confined blasting occurs at scaled velocity/charge ratios equal to or greater than the identified value of 9.

4. Vehicular activity along the aqueduct associated with blasting is expected to produce vibration levels equivalent to those along SR-76. Since these levels are below the applicable threshold criteria, no impacts are expected.

5. Operation of pneumatic drills and hammers associated with blasting would occur at the blast site which, by definition, is adjacent or outside the zone of influence. Since this type of machinery produces vibration levels far below those set for the influence zone, no significant impacts are expected.

5.0 RECOMMENDATIONS

Monitoring of the blasting operations should be performed to verify that peak vibration levels and significance criteria outlined in this report and not exceeded. Any excessive levels would be mitigated on a site-by-site basis using current techniques and technology available or where feasible. Possible methods of mitigation could include, but not be limited to, the following items.

1. The utilization by the of smaller charges (pounds per delay) by the blaster. Effective velocity magnitudes and their respective decay distances can be determined from the graphs in Appendix D.

2. The utilization of more blast holes per delay with smaller charges per hole.

3. The avoidance of confined blasts at a velocity/charge velocity ratio of less than 9.

4. If the above methods (particularly method #1) are infeasible, then realignment of the aqueduct to a distance equivalent to the worst-case zone of influence would significantly reduce the possibility of blasting impacts.

In addition, the following "common-sense" blasting measures are recommended.

1. All drilling and blasting operations should be conducted by a State-licensed blasting contractor with adequate blasting insurance.

2. Seismograph instrumentation should be placed along the aqueduct alignment in the vicinity of any blasting operations.

3. Notices should be sent to all property owners (residents) within a one mile radius of blasting and at least 24 hours prior to the commencement of blasting activities.

4. All drilling and blasting should be performed during hours designated by local, state, or federal ordinances.

6.0 CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Ogden Environmental and Energy Services Company of San Diego, California. The members of the professional staff contributing to this report are listed below.

Rick Tavares, M.S. Mechanical Engineering and M.S. Structural Engineering, EIT, INCE
Jeffrey D. Fuller; B.S. Environmental Health, REHS
Rick Carpenter; B.A. Political Science

We hereby affirm that, to the best of our knowledge and belief, the statements and information provided in this document are in all respects true and correct, and that all known information concerning the vibratory environment of the project has been included and fully evaluated in this engineering technical report.

Rick Tavares

Rick Tavares, Reg. EIT XE098024
Acoustical and Vibration Engineer

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APPENDIX A

FREE VIBRATION TEST DATA

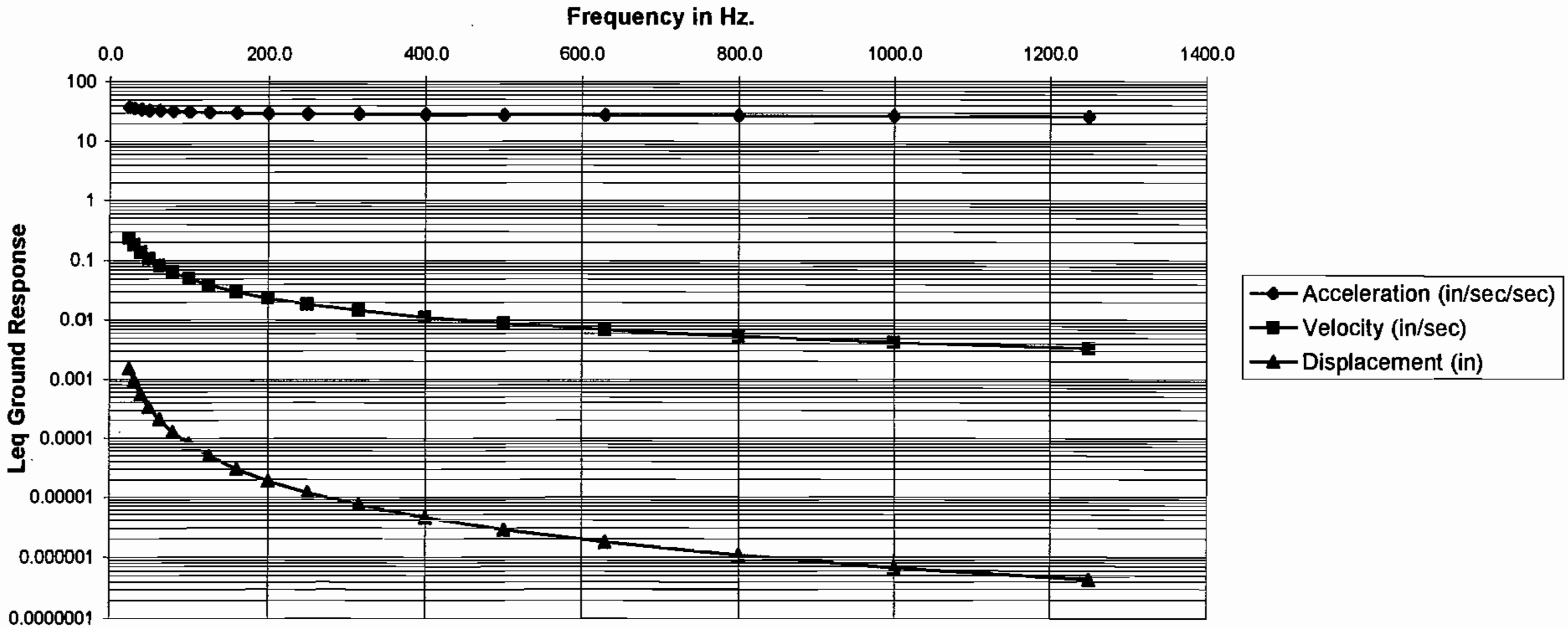
APPENDIX A
FREE VIBRATION TEST DATA

The following figures provide a semi-logarithmic representation of the free vibration data obtained at monitoring locations GF 1 through 10. Values of the acceleration, velocity, and displacement are given for each monitoring point as a function of the 15- minute integrated levels (L_{eq}), the minimum measured levels (L_{min}), and the maximum measured levels (L_{max}).

The measurement locations correspond to the actual aqueduct portal survey markers present at the site (except where noted). They are referenced below and shown graphically in Figure 3 in the main report.

- GF 1: Measurement @ 2080+63.50
- GF 2: Measurement @ 2072+95.52
- GF 3: Measurement @ 2067+01.24
- GF 4: Measurement @ 2061+93.21
- GF 5: Measurement @ 1973+39.51
- GF 6: Measurement @ 1967+53.39
- GF 7: Measurement @ 1956+48.31
- GF 8: Measurement @ 1950+51.93
- GF 9: Measurement @ 1945+48.40
- GF 10: Measurement along aqueduct crossing of SR-76 at a distance of 20 feet from roadway centerline.

Free Vibration Monitoring Location GF 1



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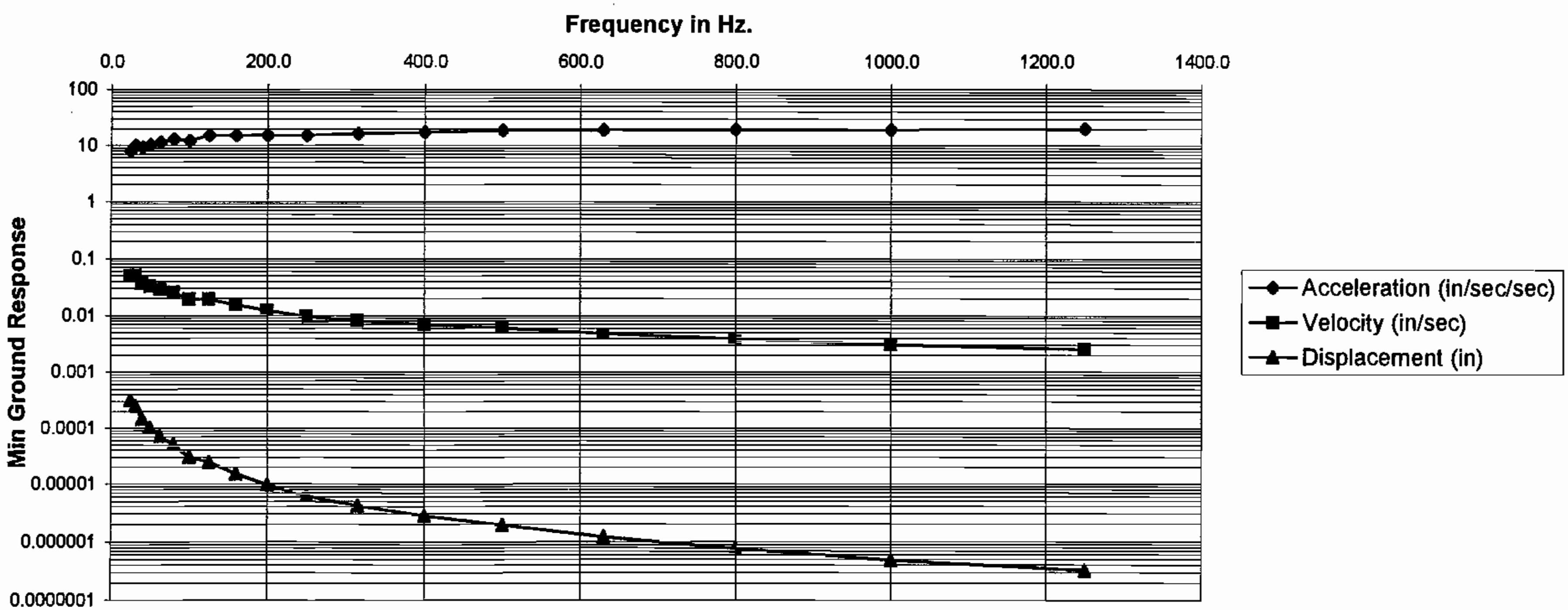

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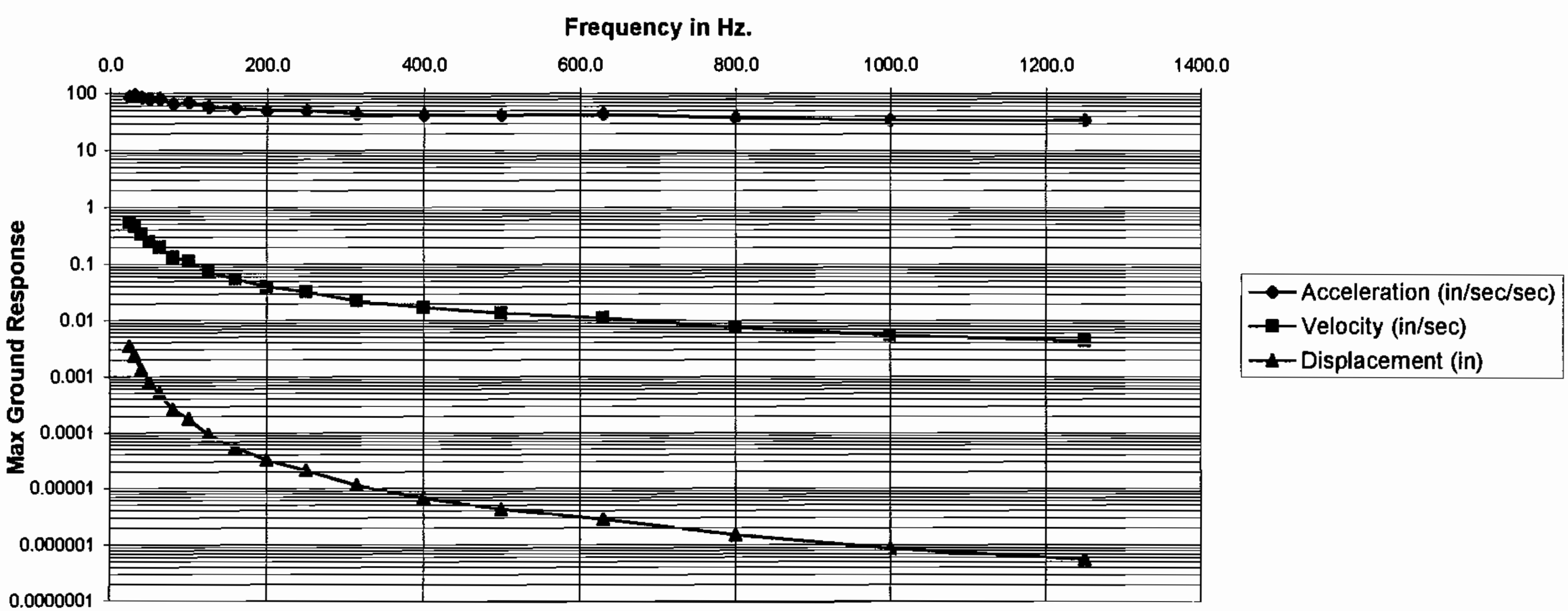

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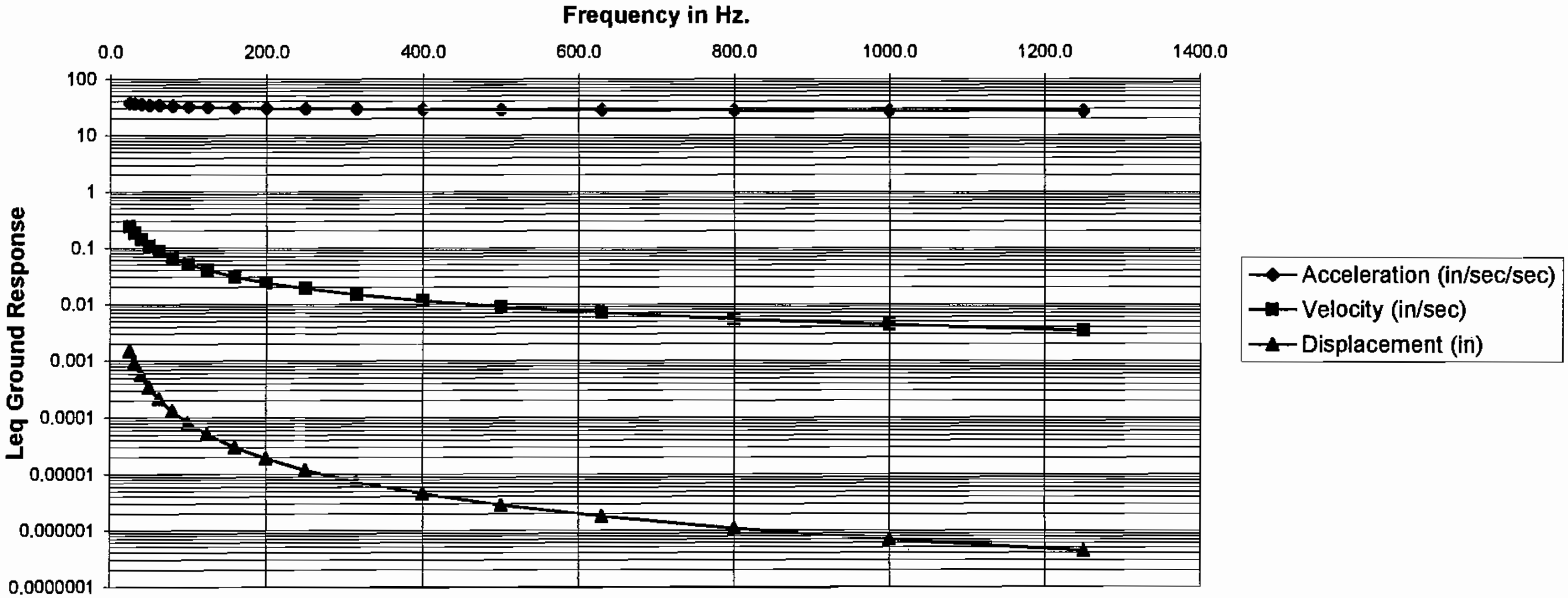

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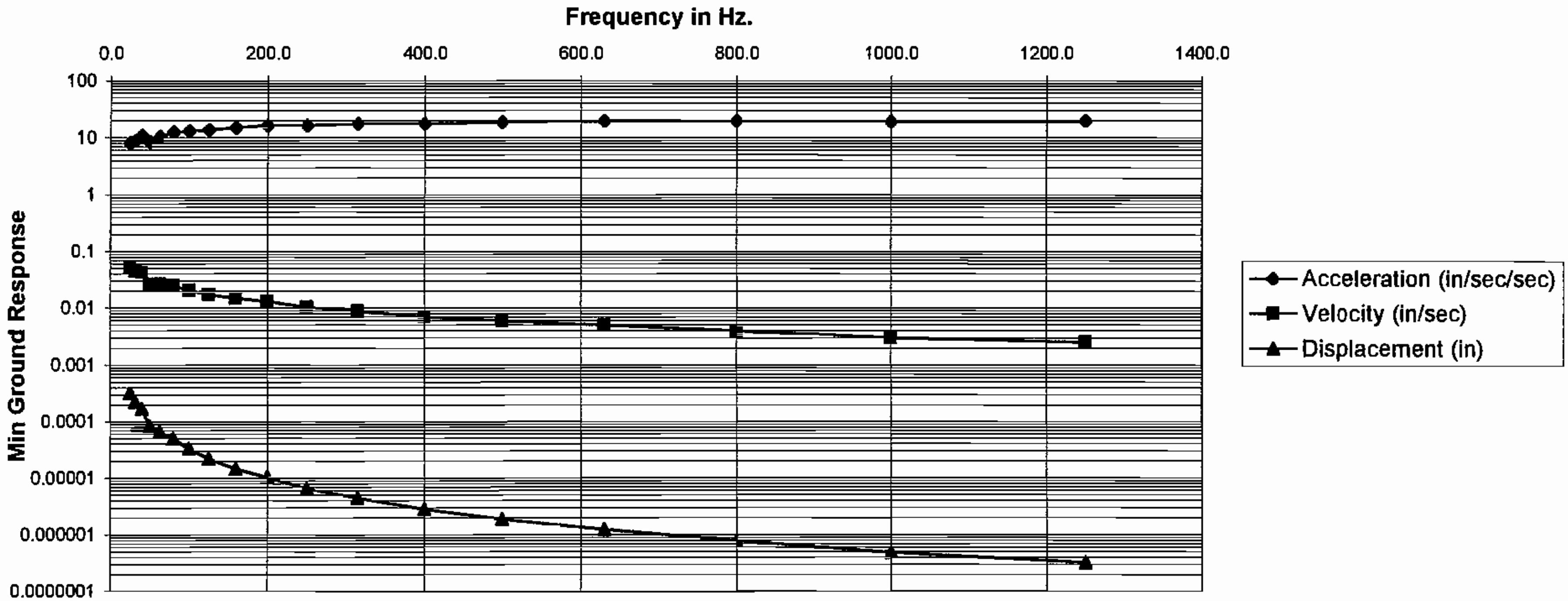
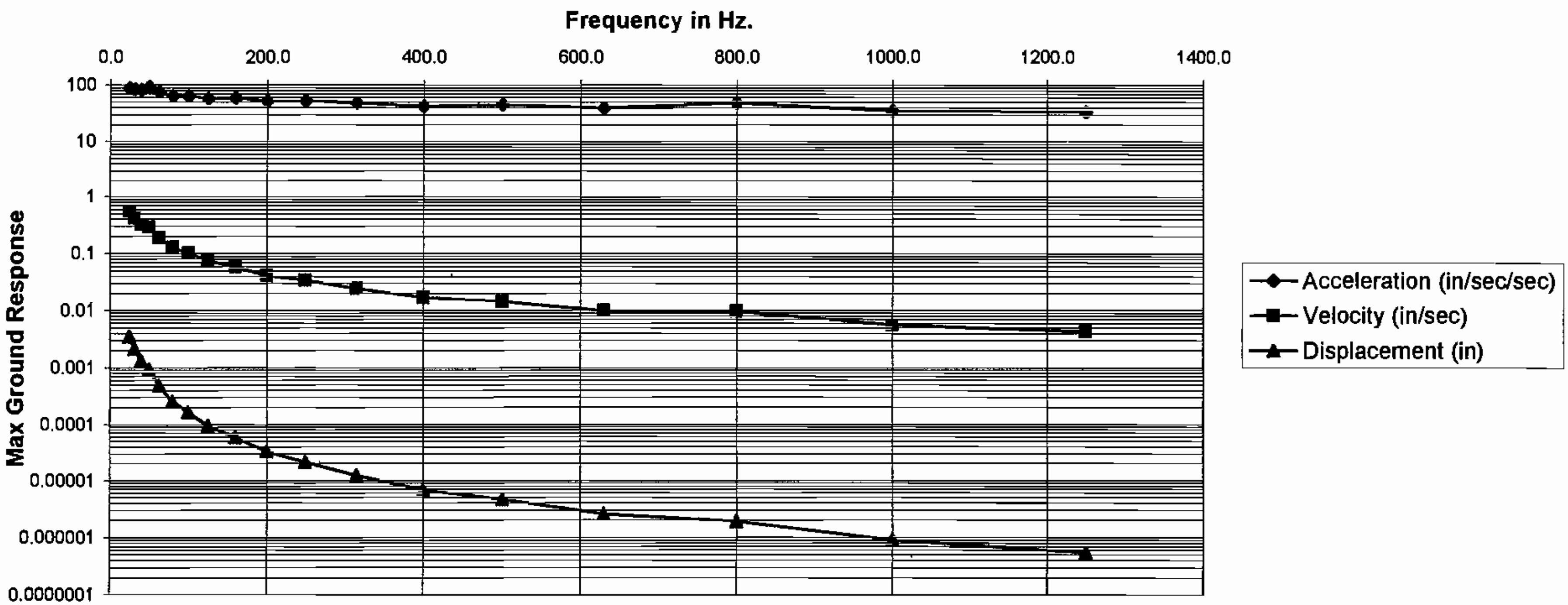


Free Vibration Monitoring Location GF 2



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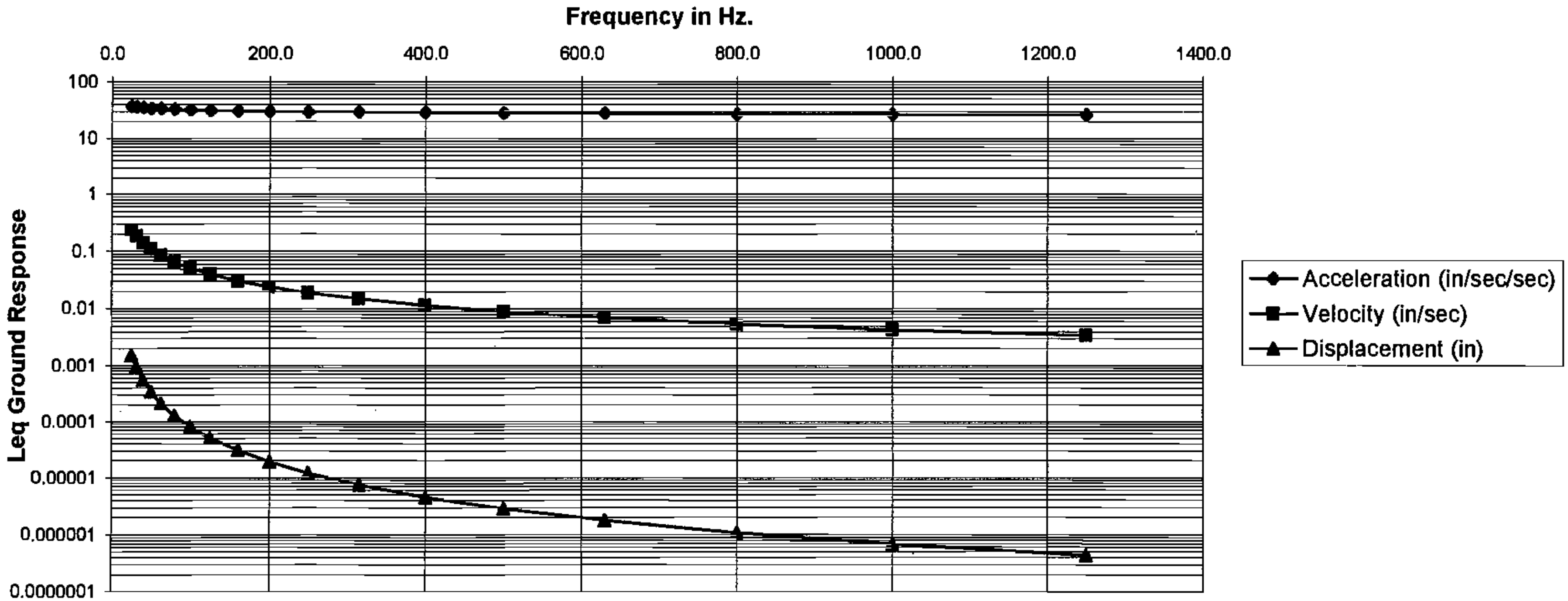

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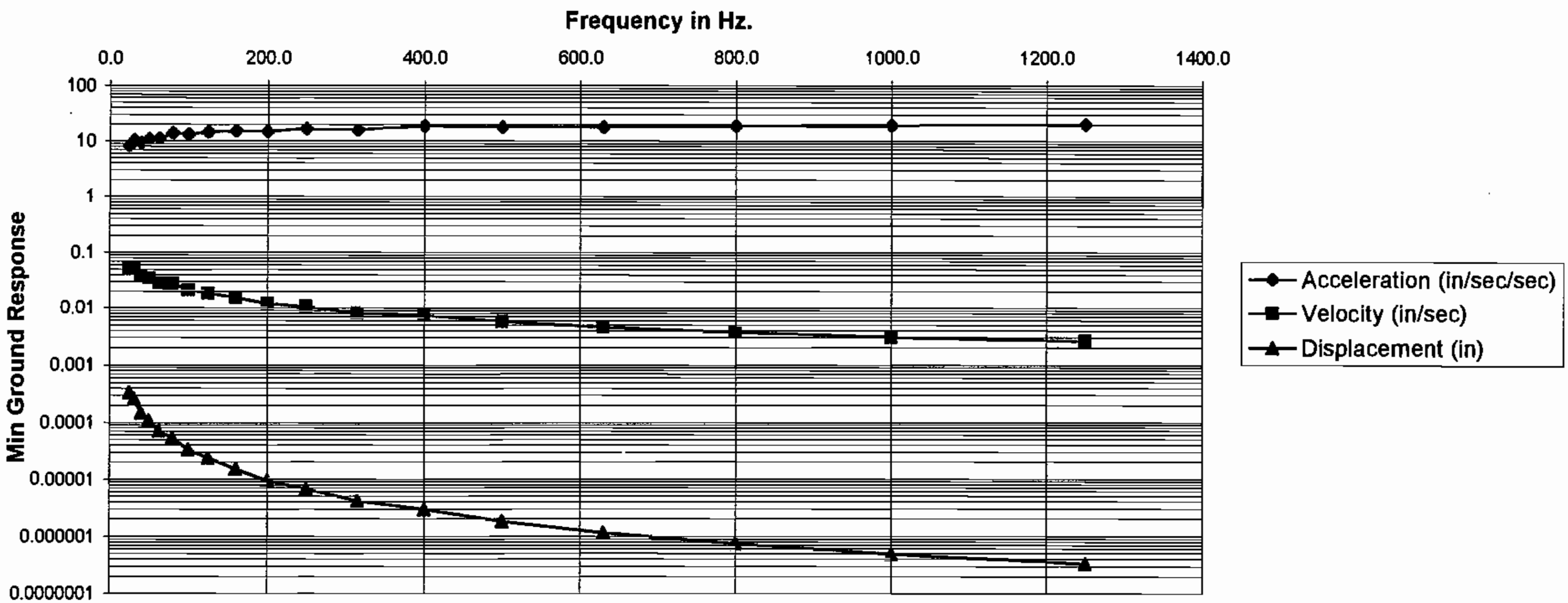

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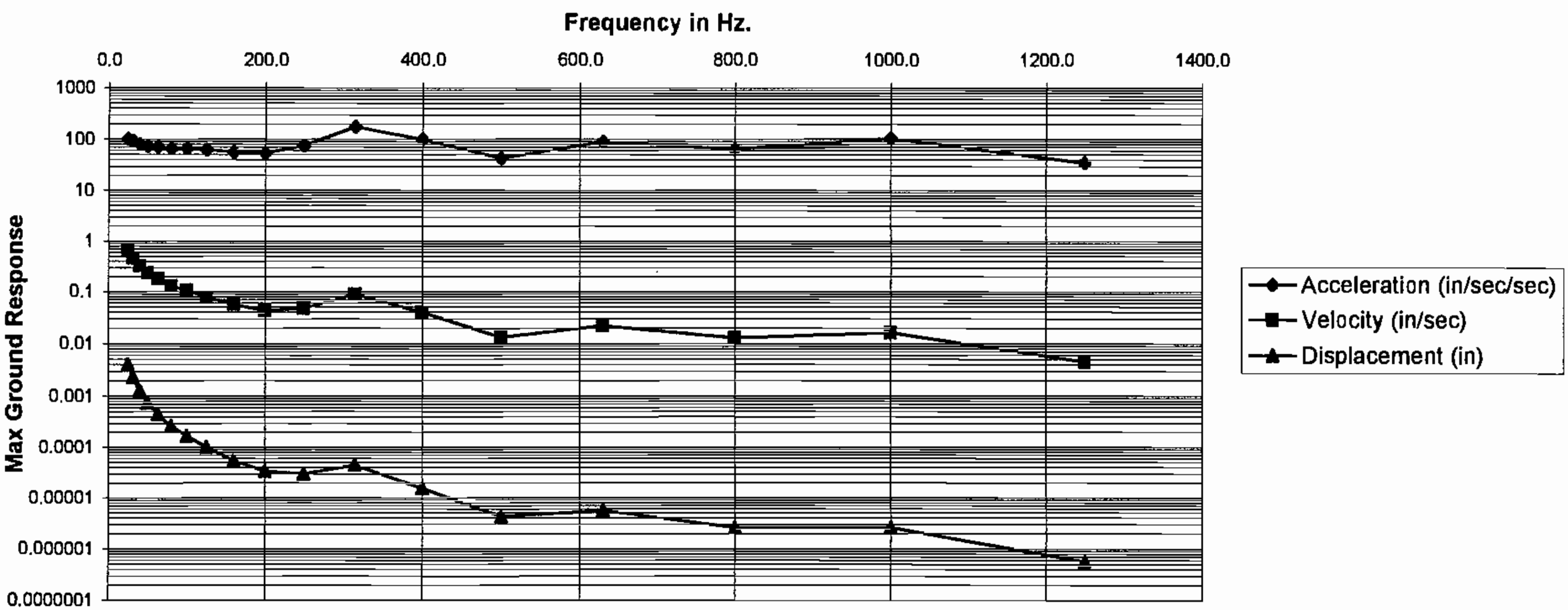

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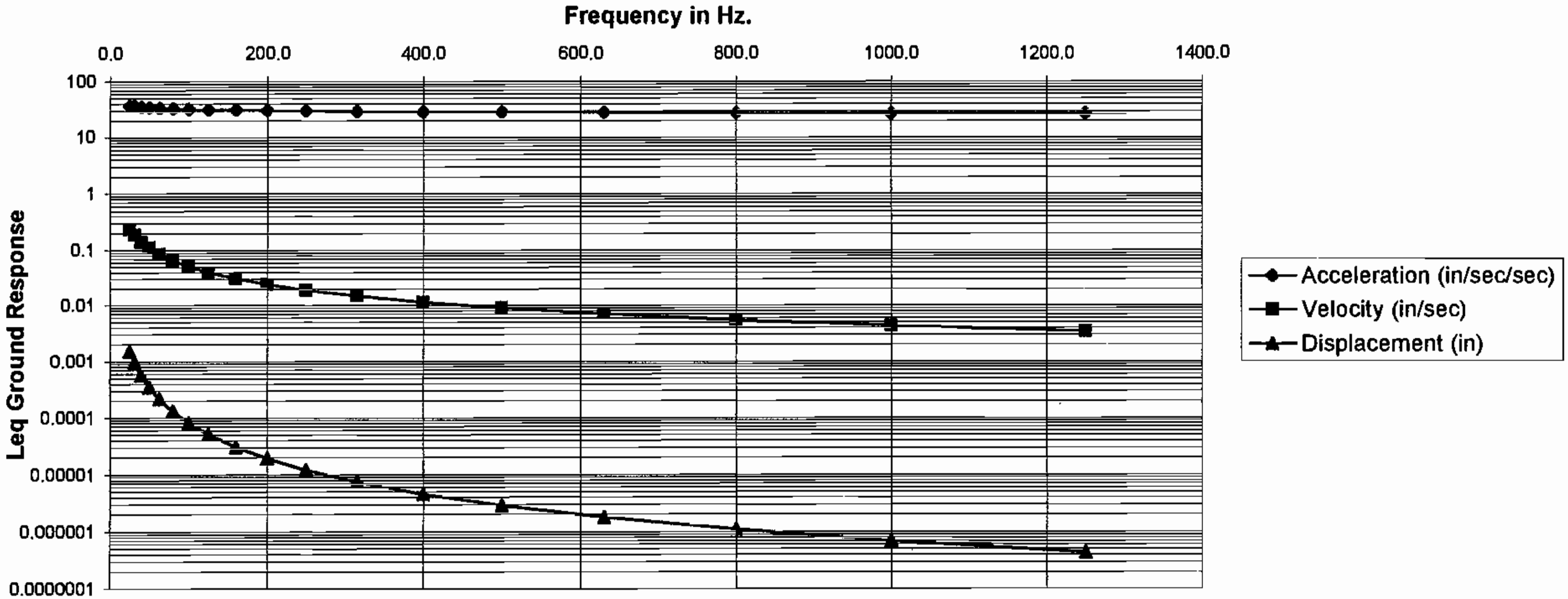
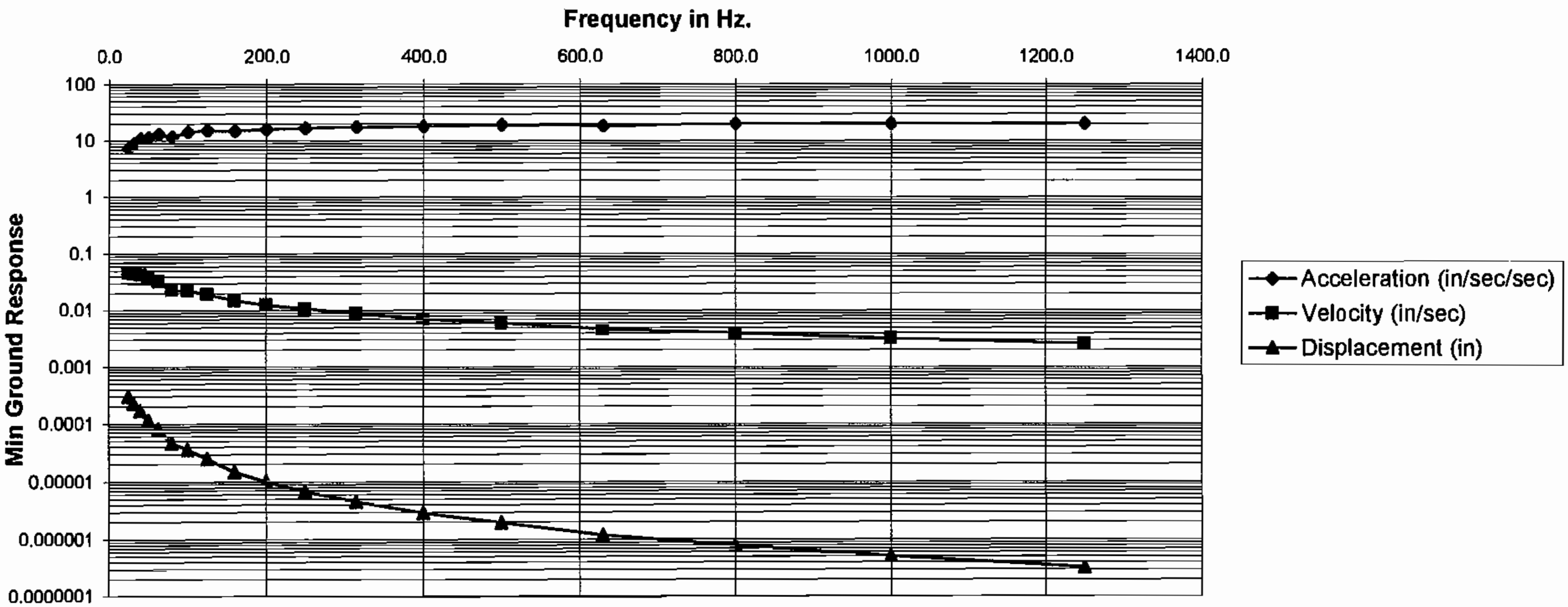
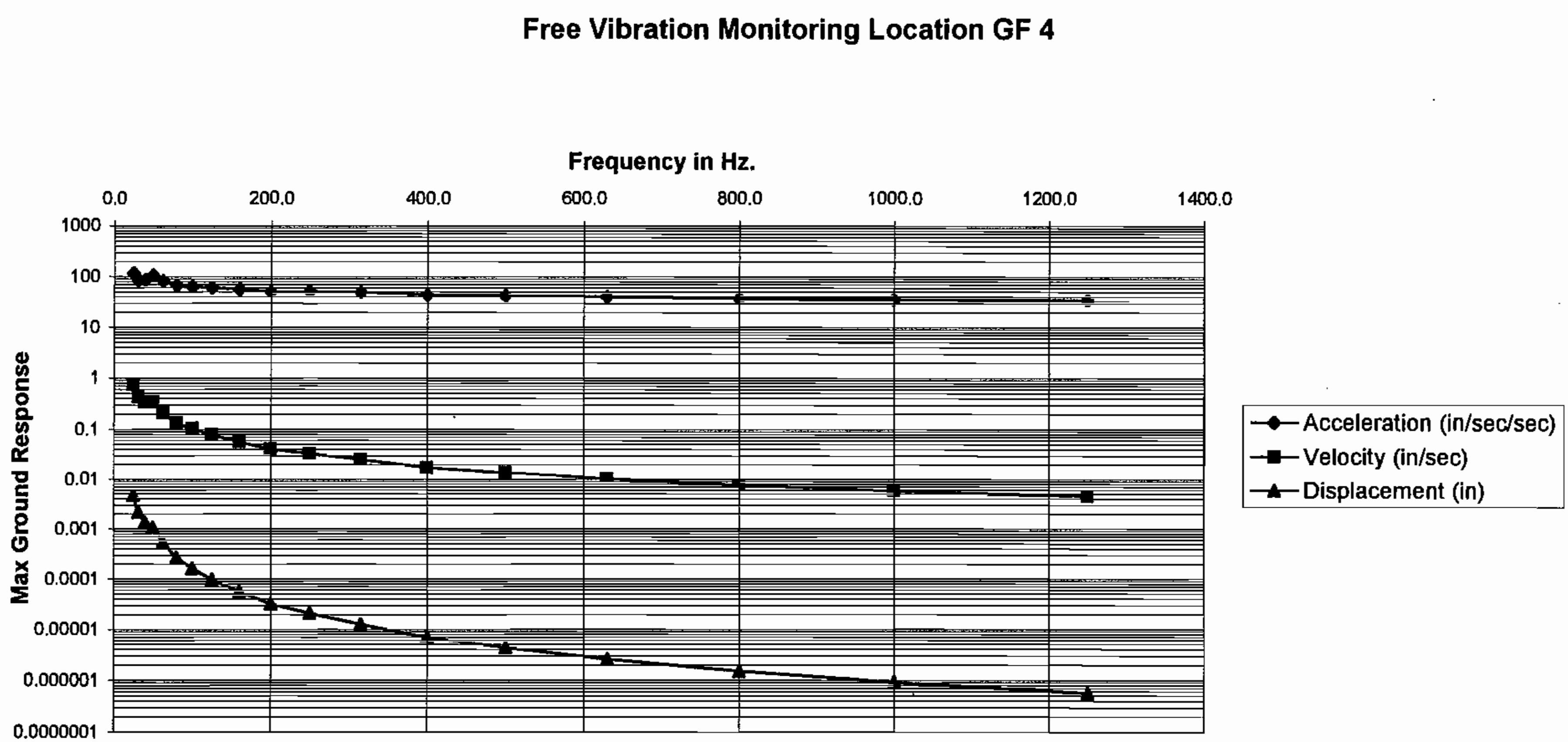


Free Vibration Monitoring Location GF 4




Free Vibration Monitoring Location GF 4
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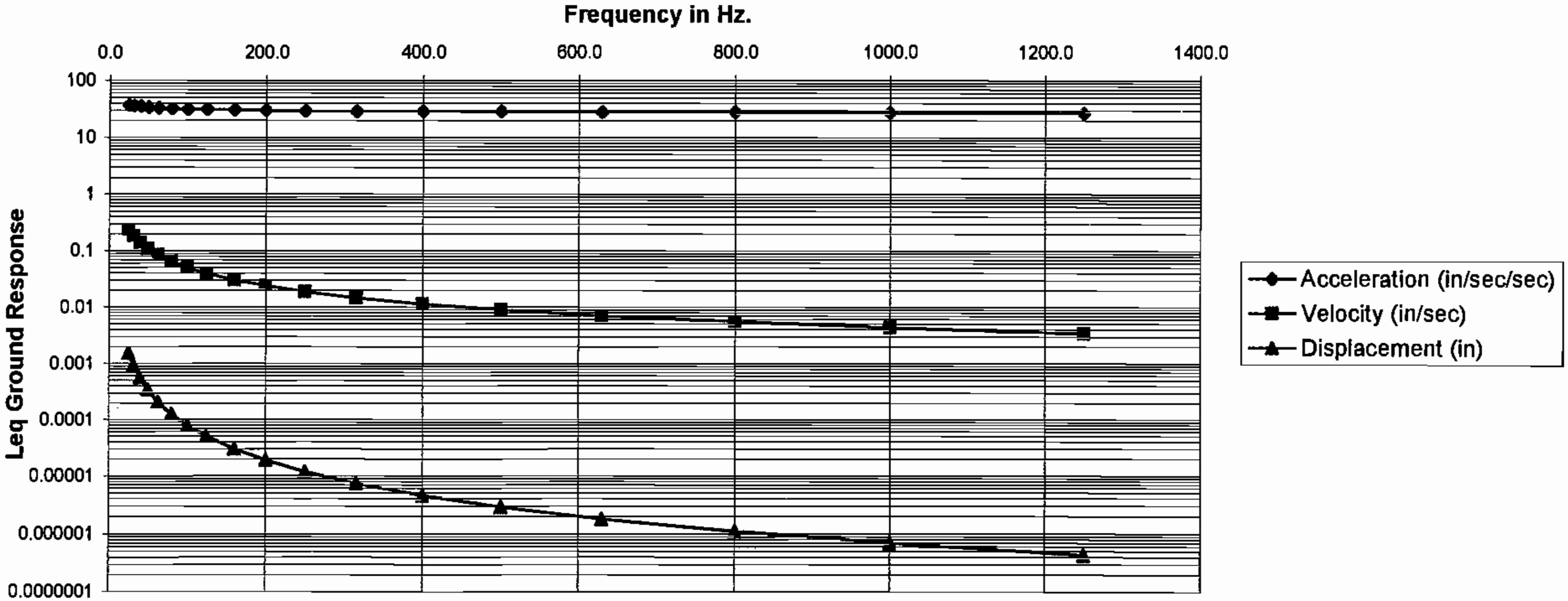
800.0
1000.0
1200.0
1400.0
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
Max Ground Response
Acceleration (in/sec/sec)
Velocity (in/sec)
Displacement (in)

Free Vibration Monitoring Location GF 5



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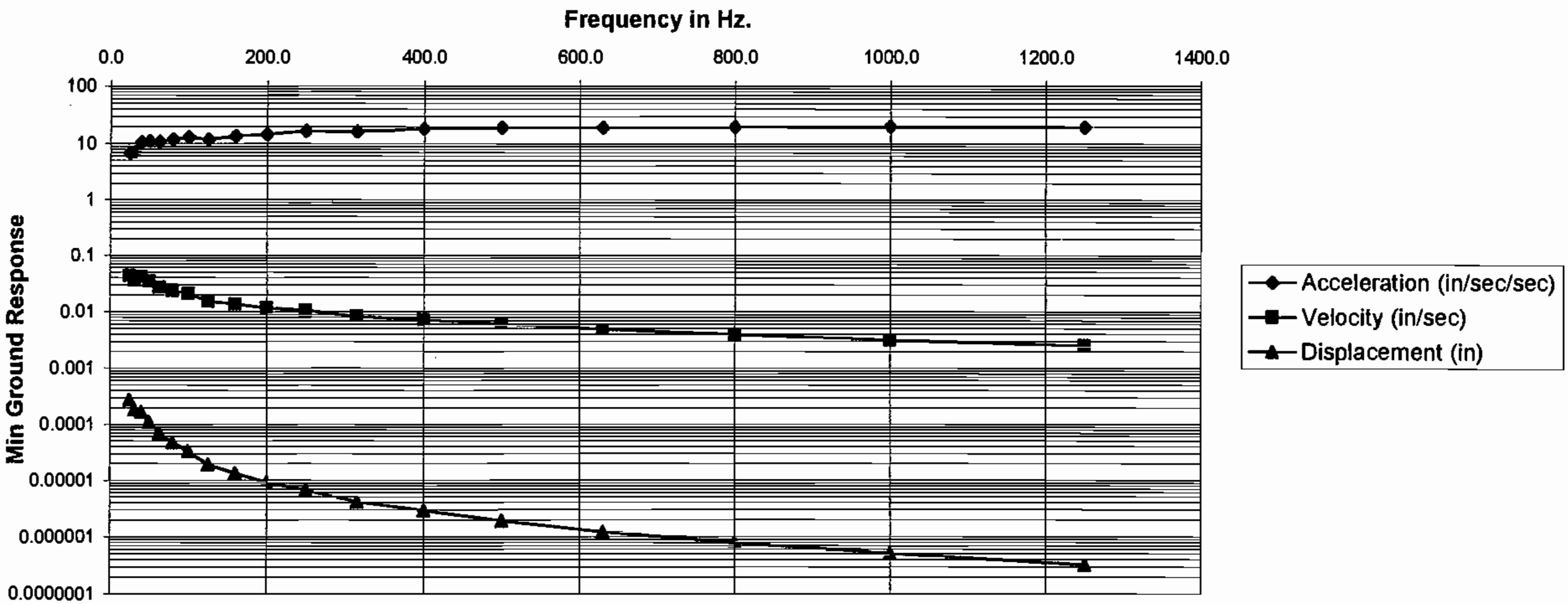

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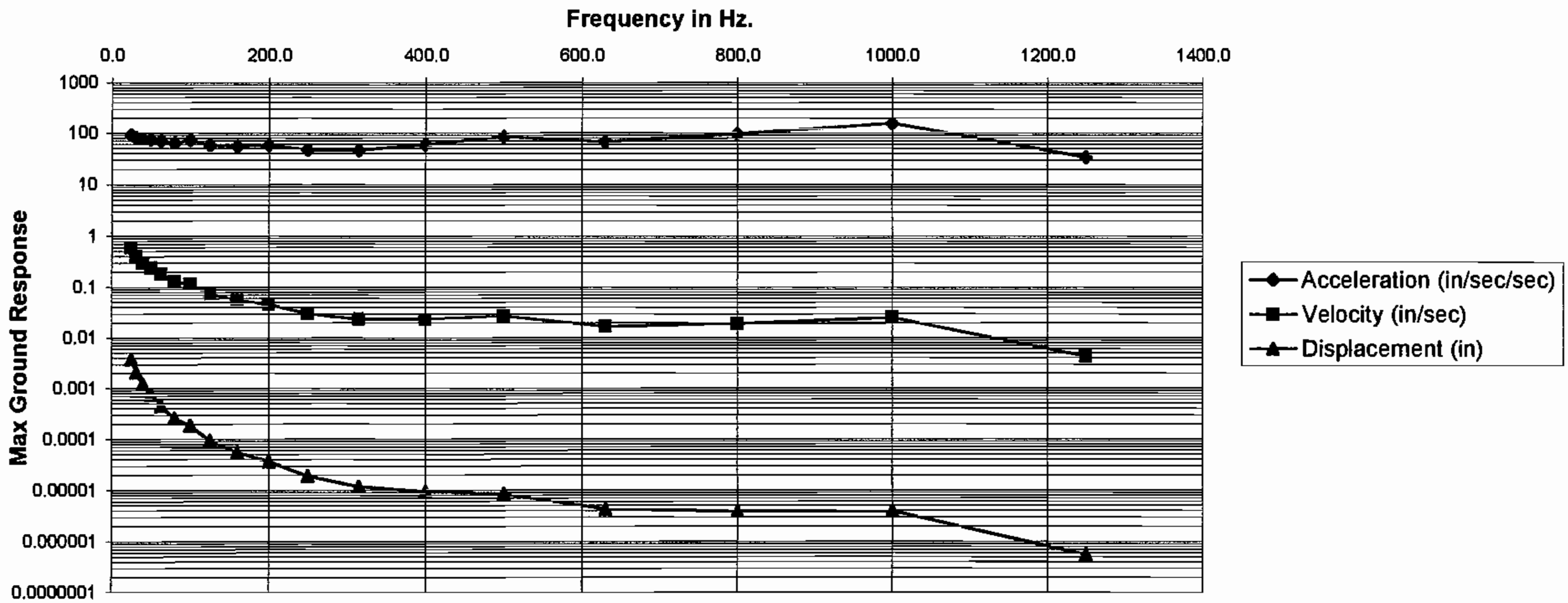

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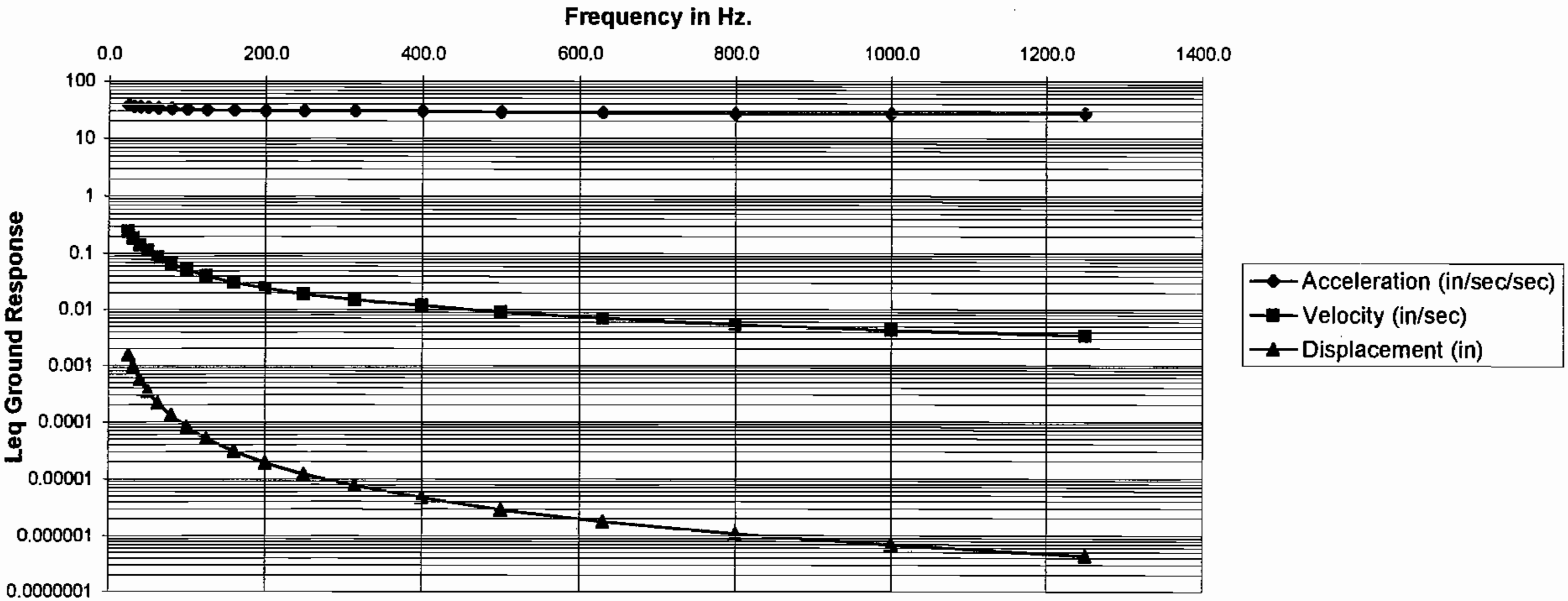

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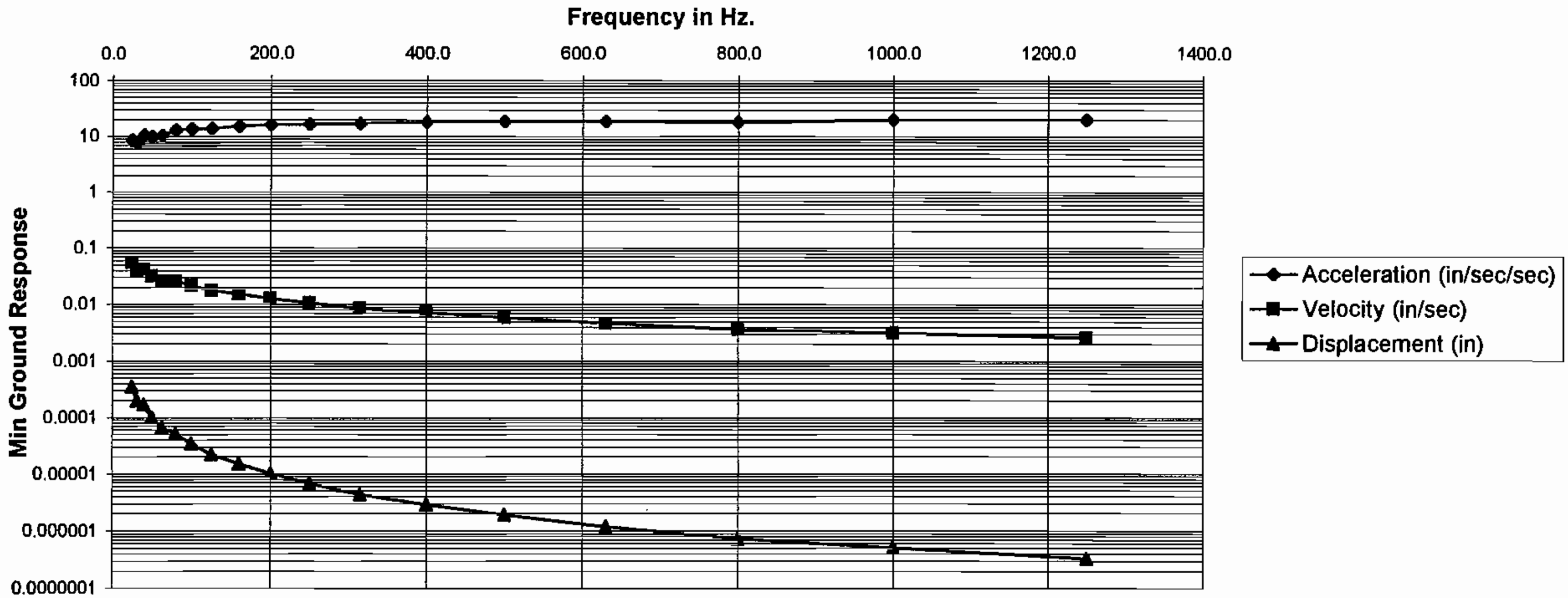
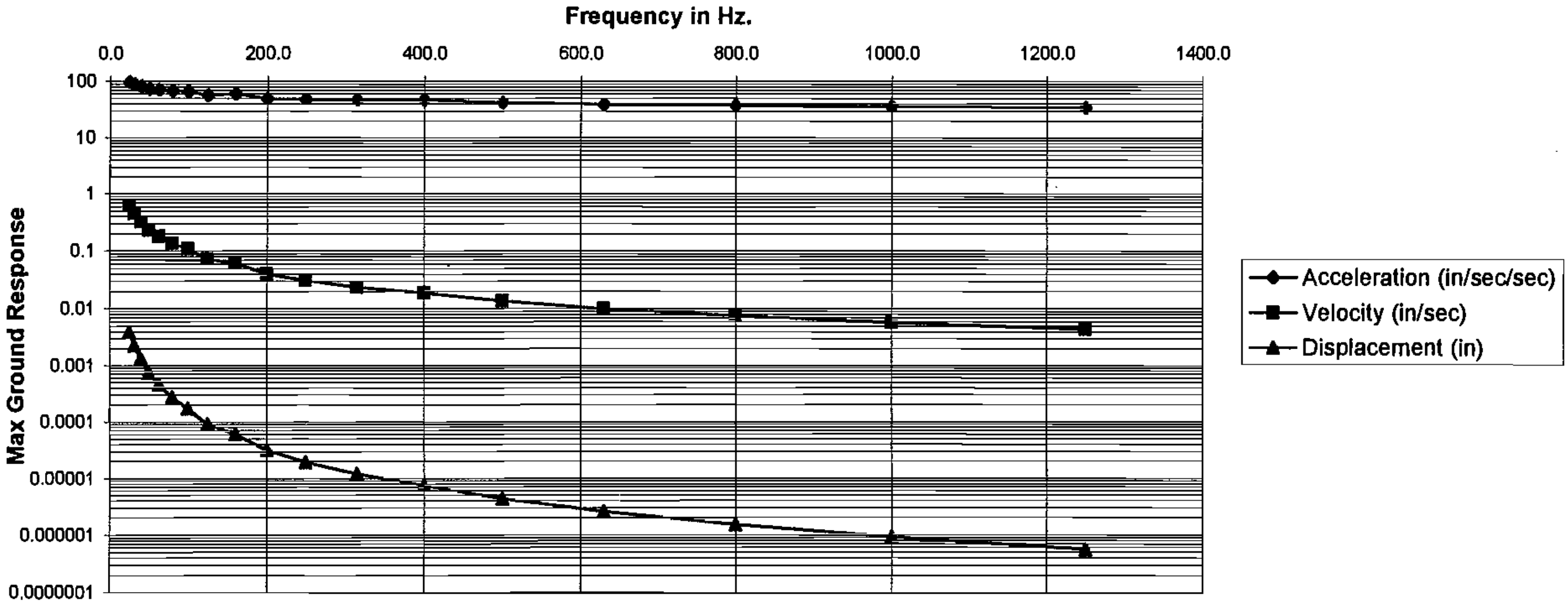
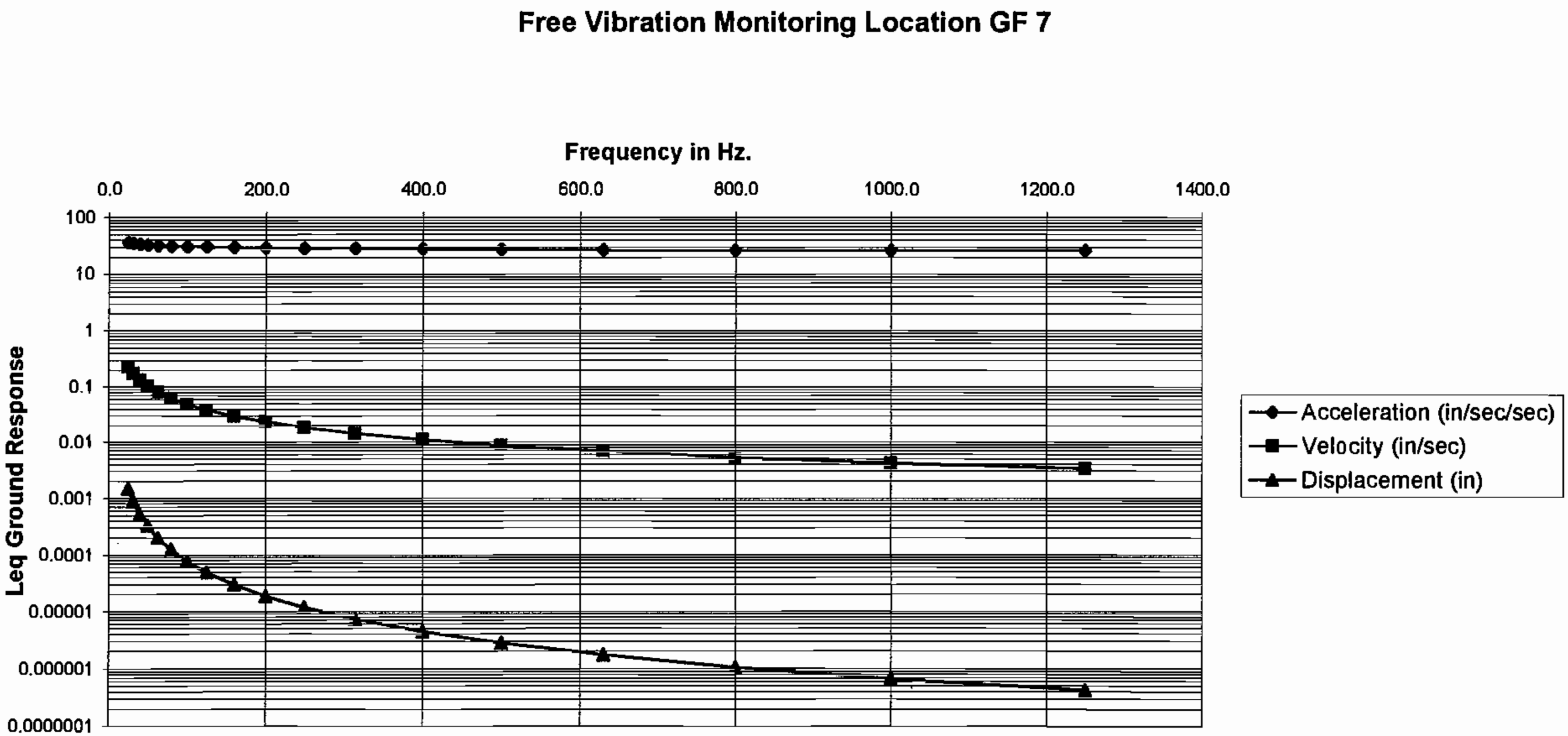


Free Vibration Monitoring Location GF 6




Free Vibration Monitoring Location GF 7
Frequency in Hz.
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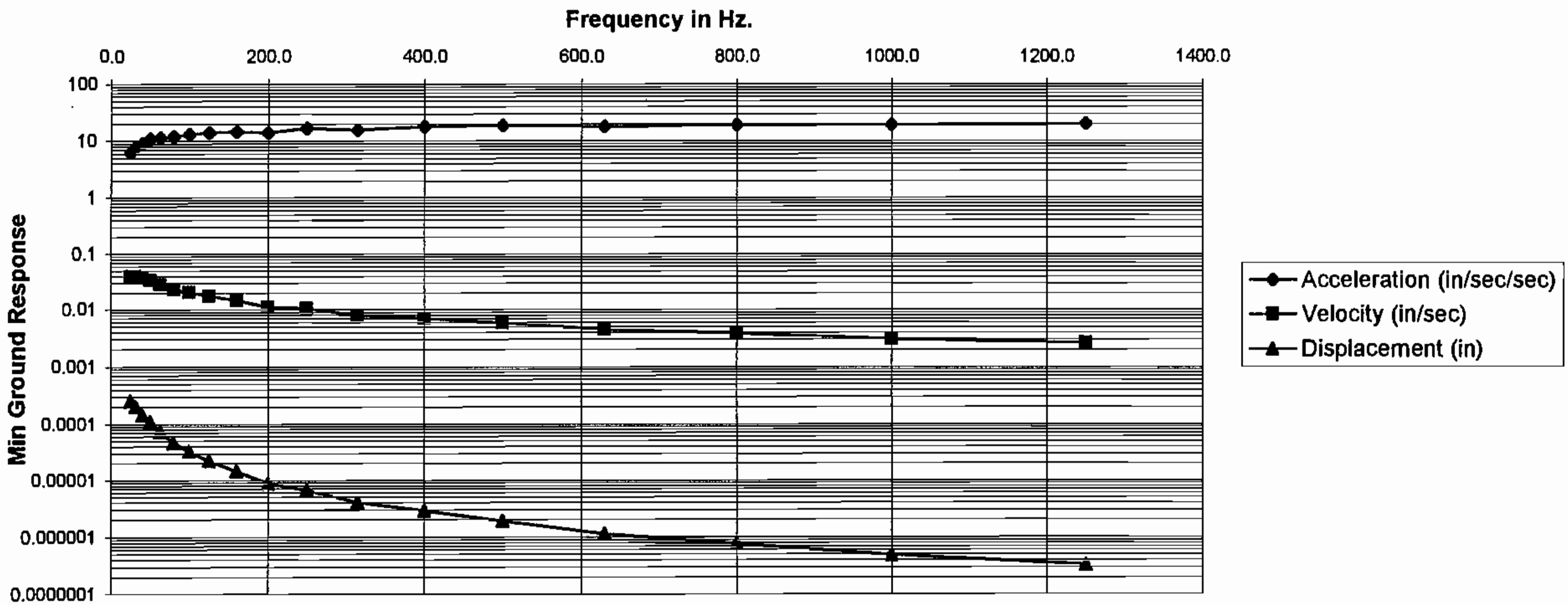
400.0
600.0
800.0
1000.0
1200.0
1400.0
Leq Ground Response
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
Acceleration (in/sec/sec)
Velocity (in/sec)
Displacement (in)

Free Vibration Monitoring Location GF 7



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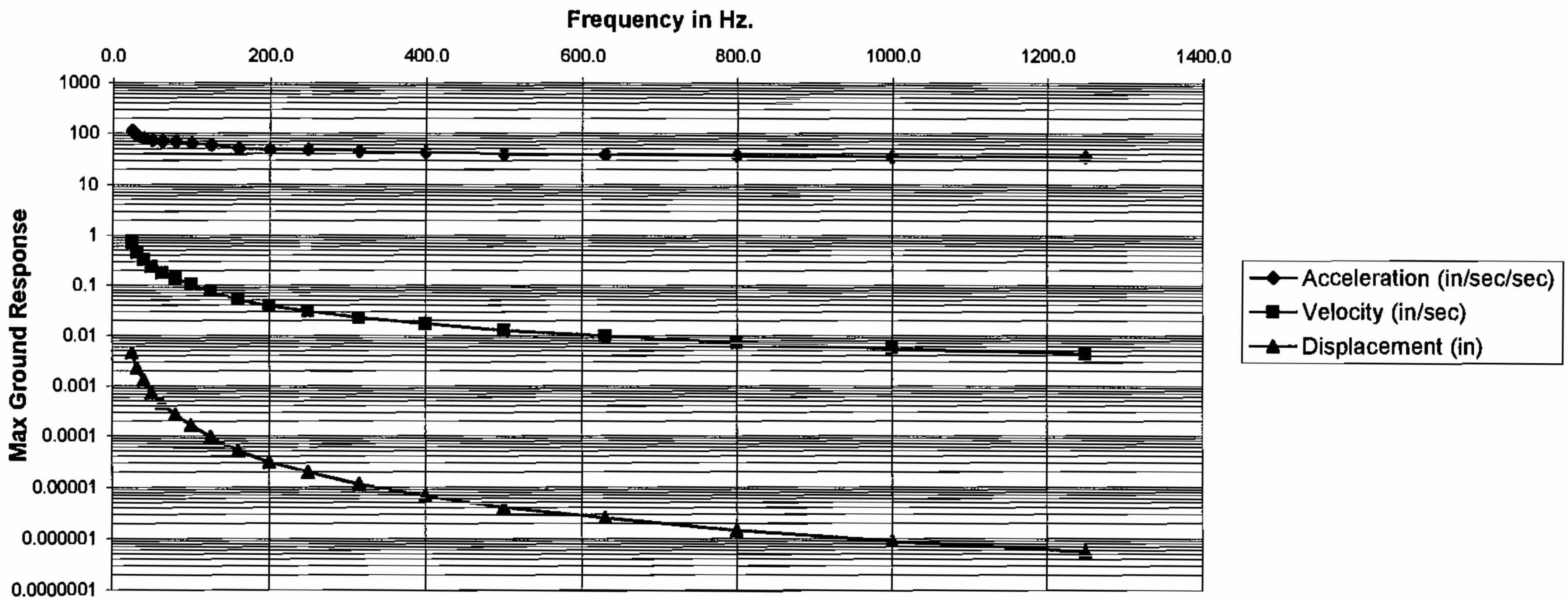

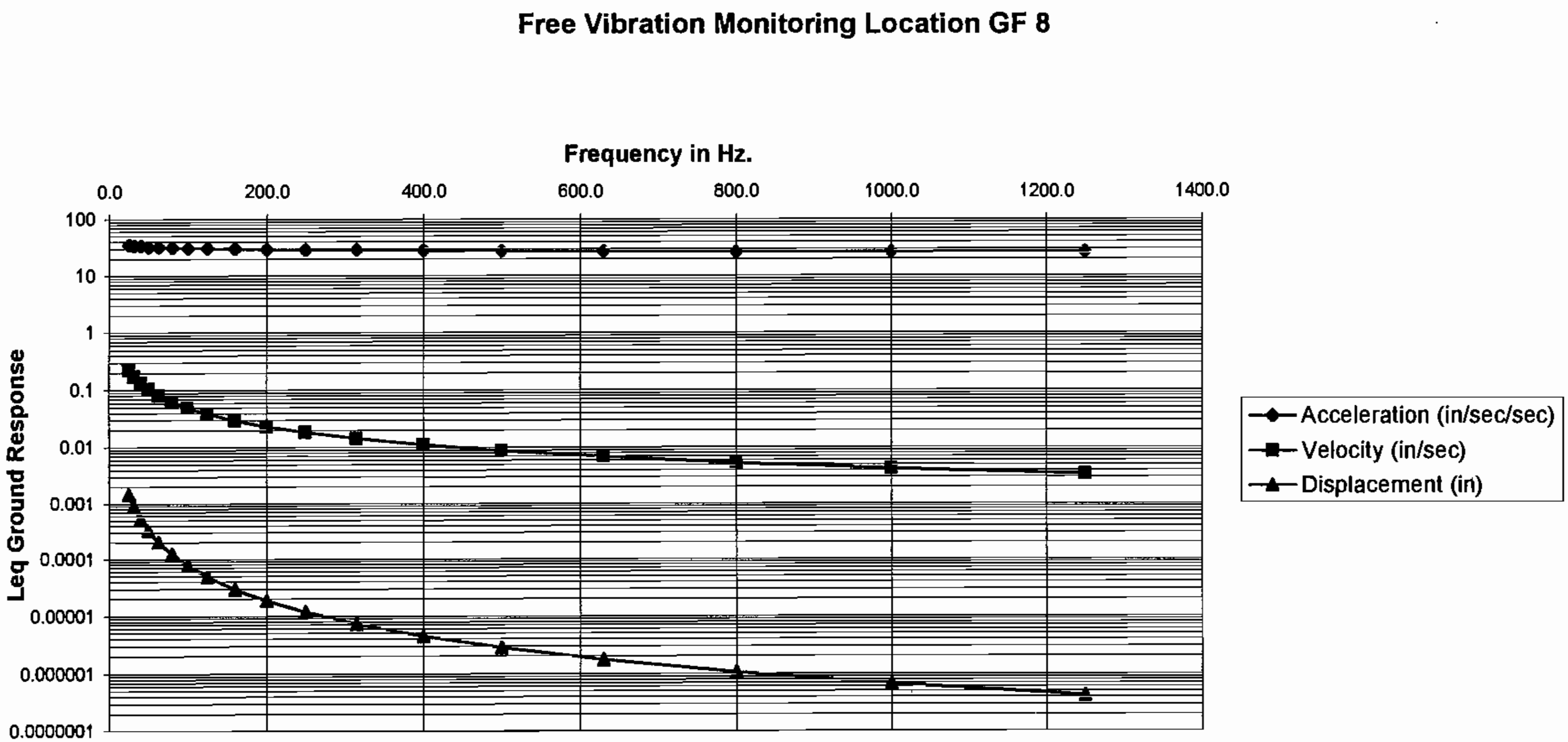

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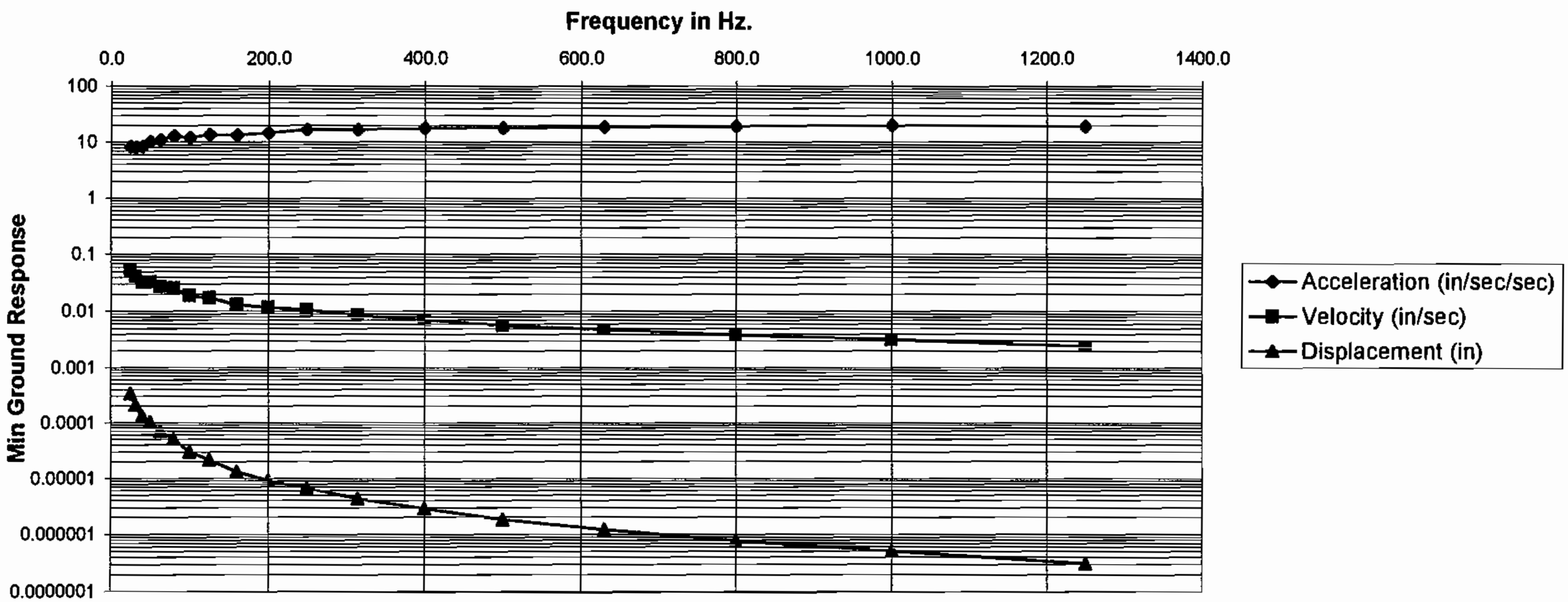
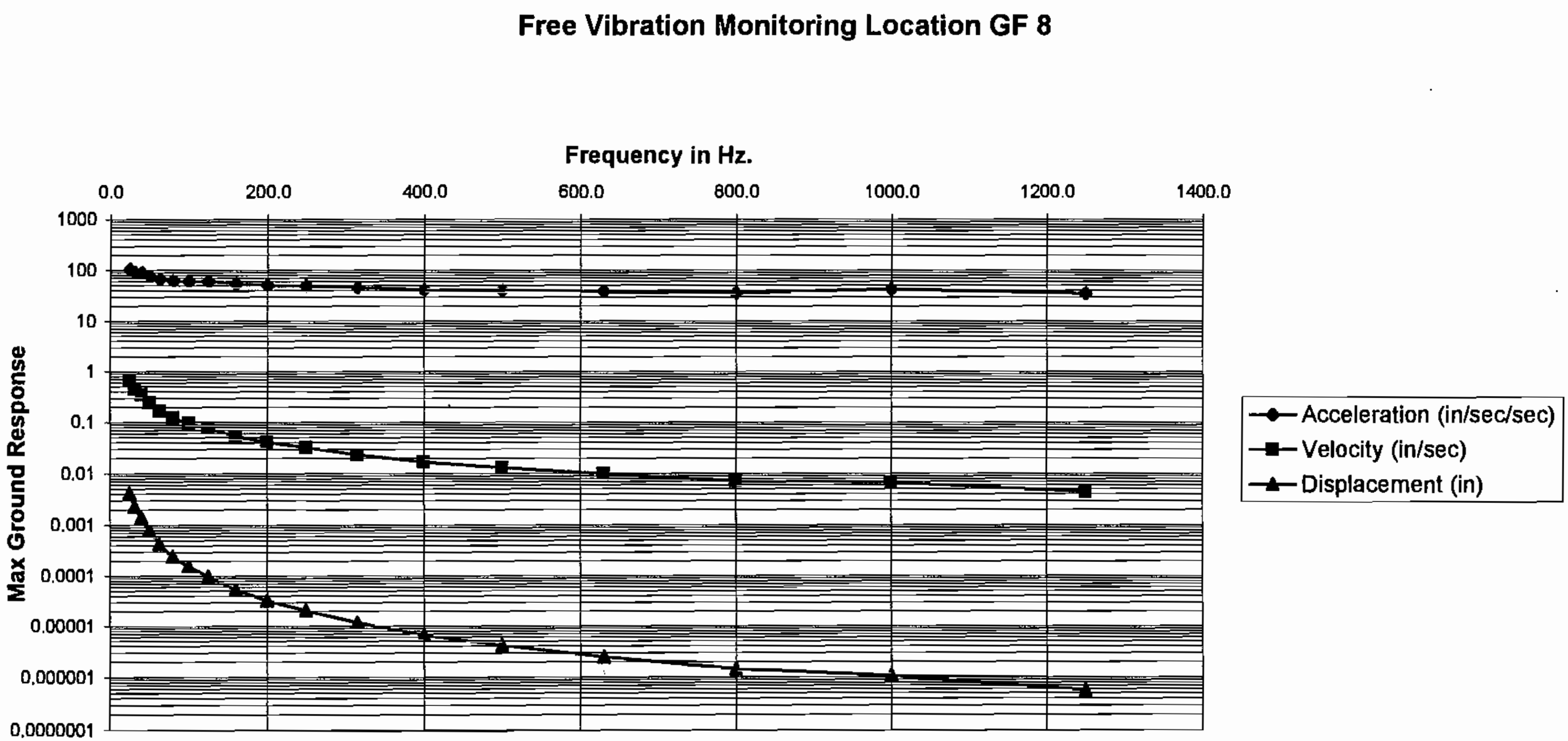
800.0
1000.0
1200.0
1400.0
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
Leq Ground Response
Acceleration (in/sec/sec)
Velocity (in/sec)
Displacement (in)

Free Vibration Monitoring Location GF 8

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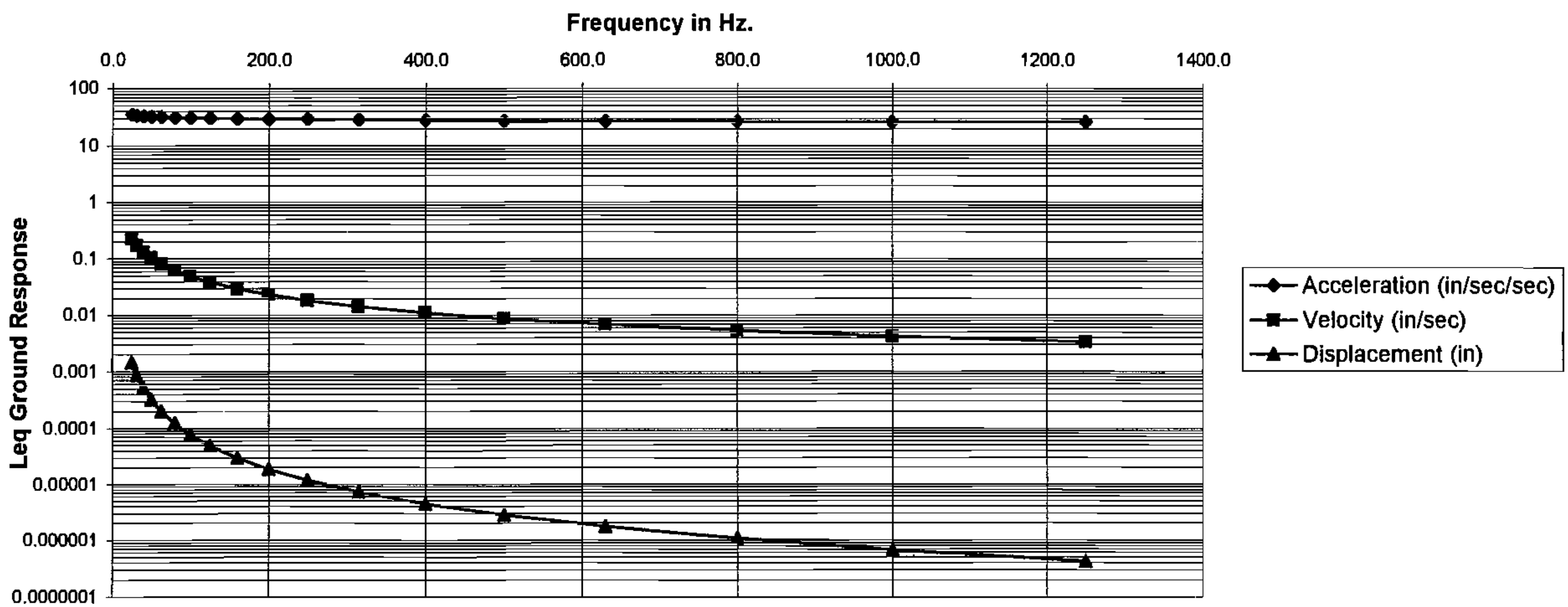
1000.0
1200.0
1400.0
Max Ground Response
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
0.0000001
Acceleration (in/sec/sec)
Velocity (in/sec)
Displacement (in)

Free Vibration Monitoring Location GF 9



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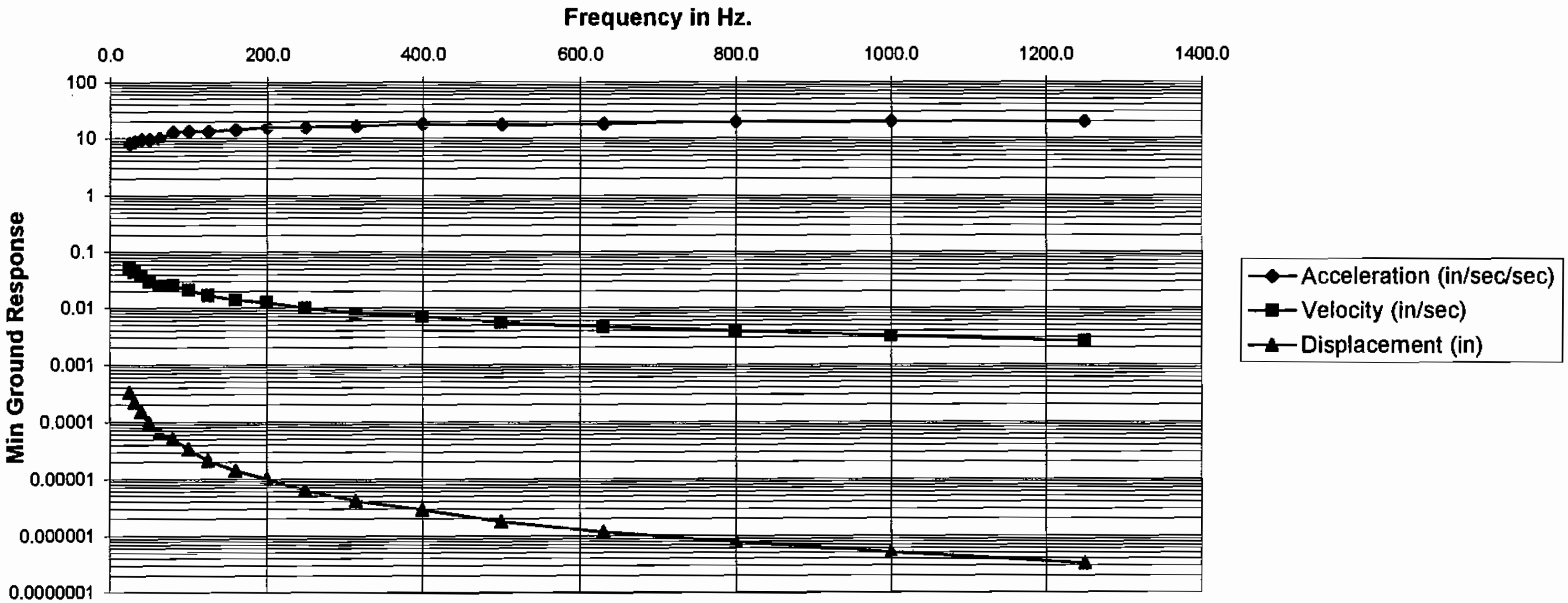

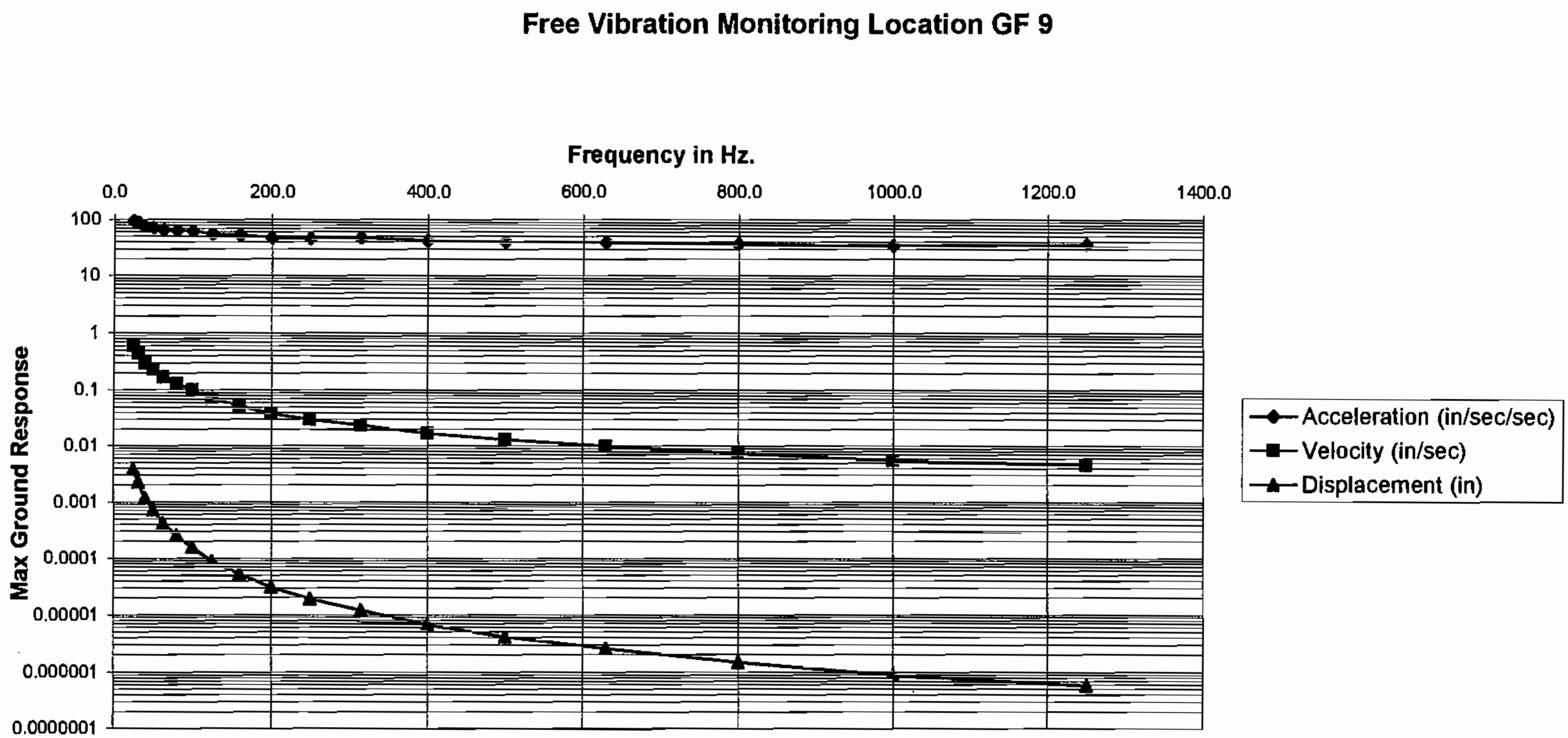

Free Vibration Monitoring Location GF 9
Frequency in Hz.
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400.0
600.0
800.0
1000.0
1200.0
1400.0
Max Ground Response
100
10
1
0.1
0.01
0.001
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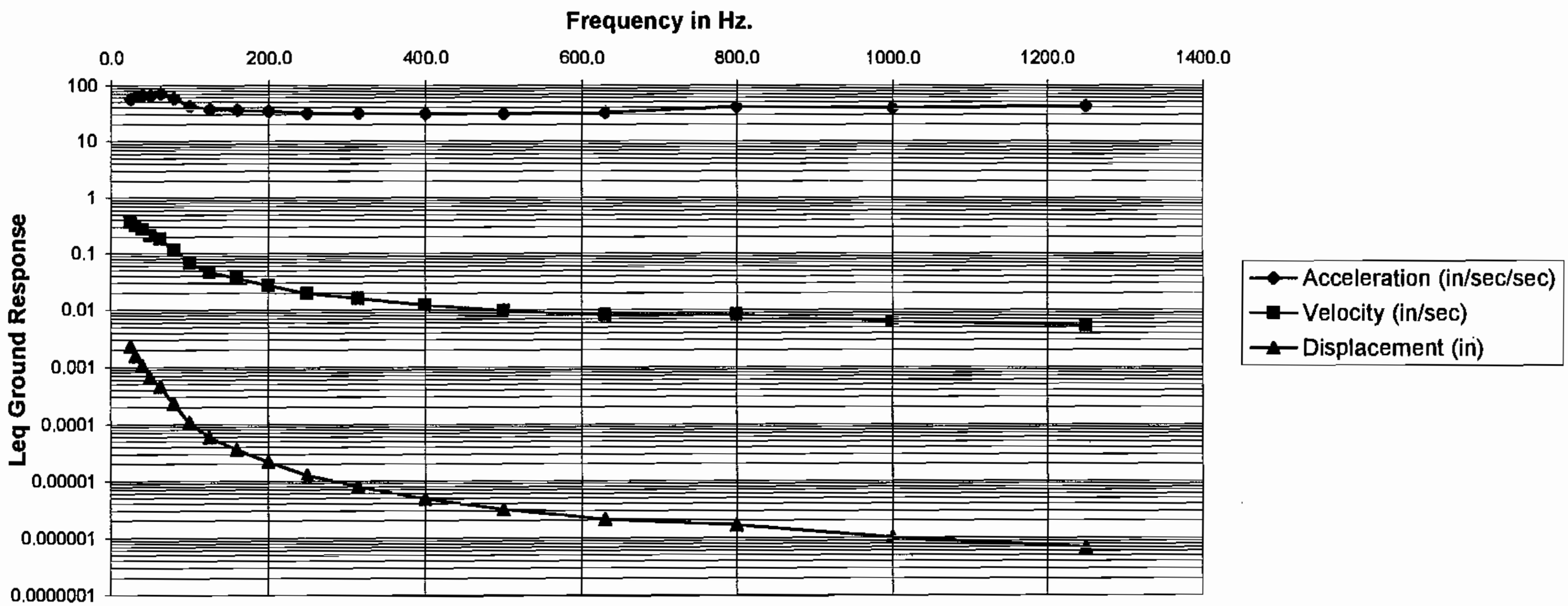
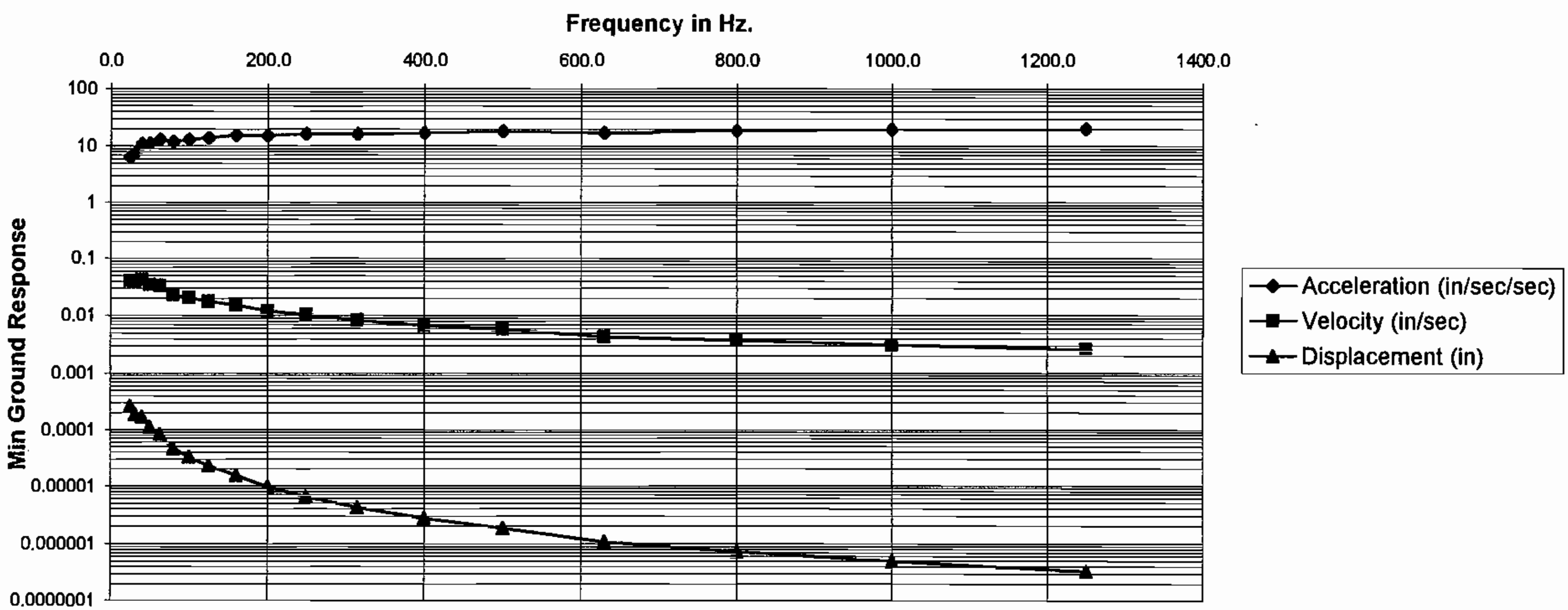
Acceleration (in/sec/sec)
Velocity (in/sec)
Displacement (in)

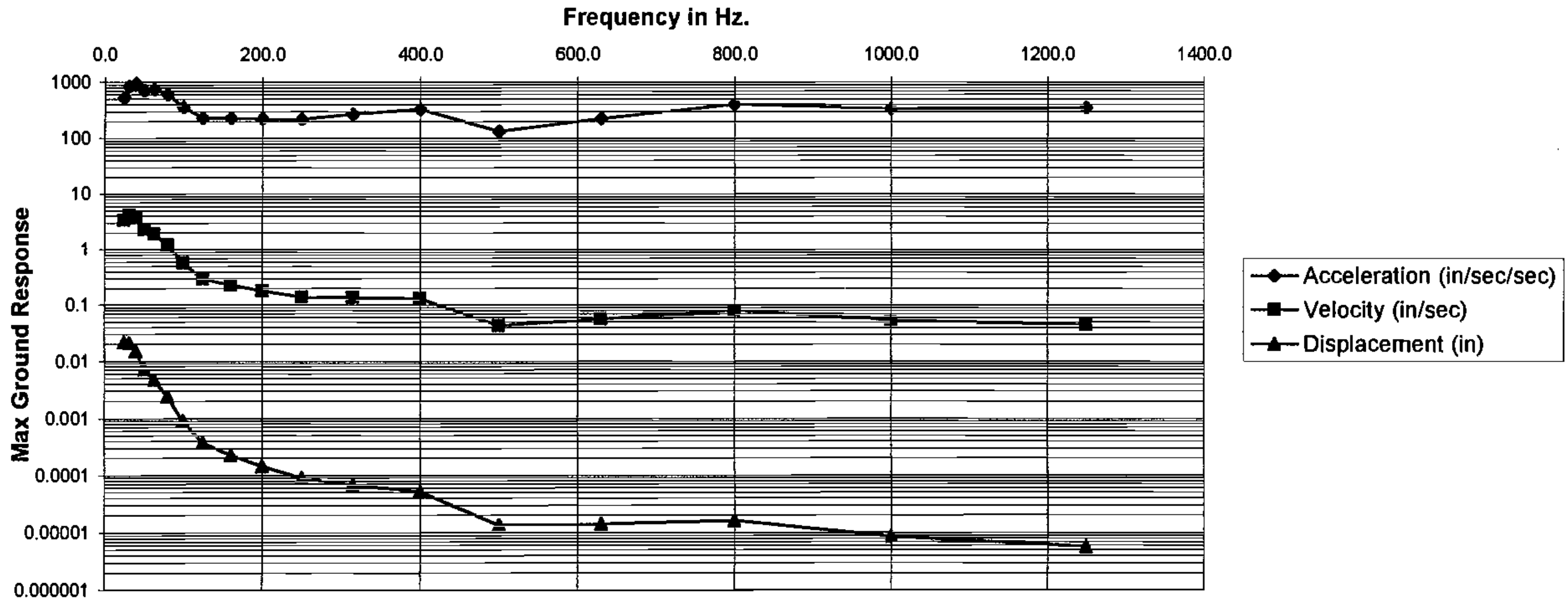
Free Vibration Monitoring Location GF 10



Free Vibration Monitoring Location GF 10



Free Vibration Monitoring Location GF 10



APPENDIX B

FREQUENCY RESPONSE/ MODAL DAMPING TEST DATA

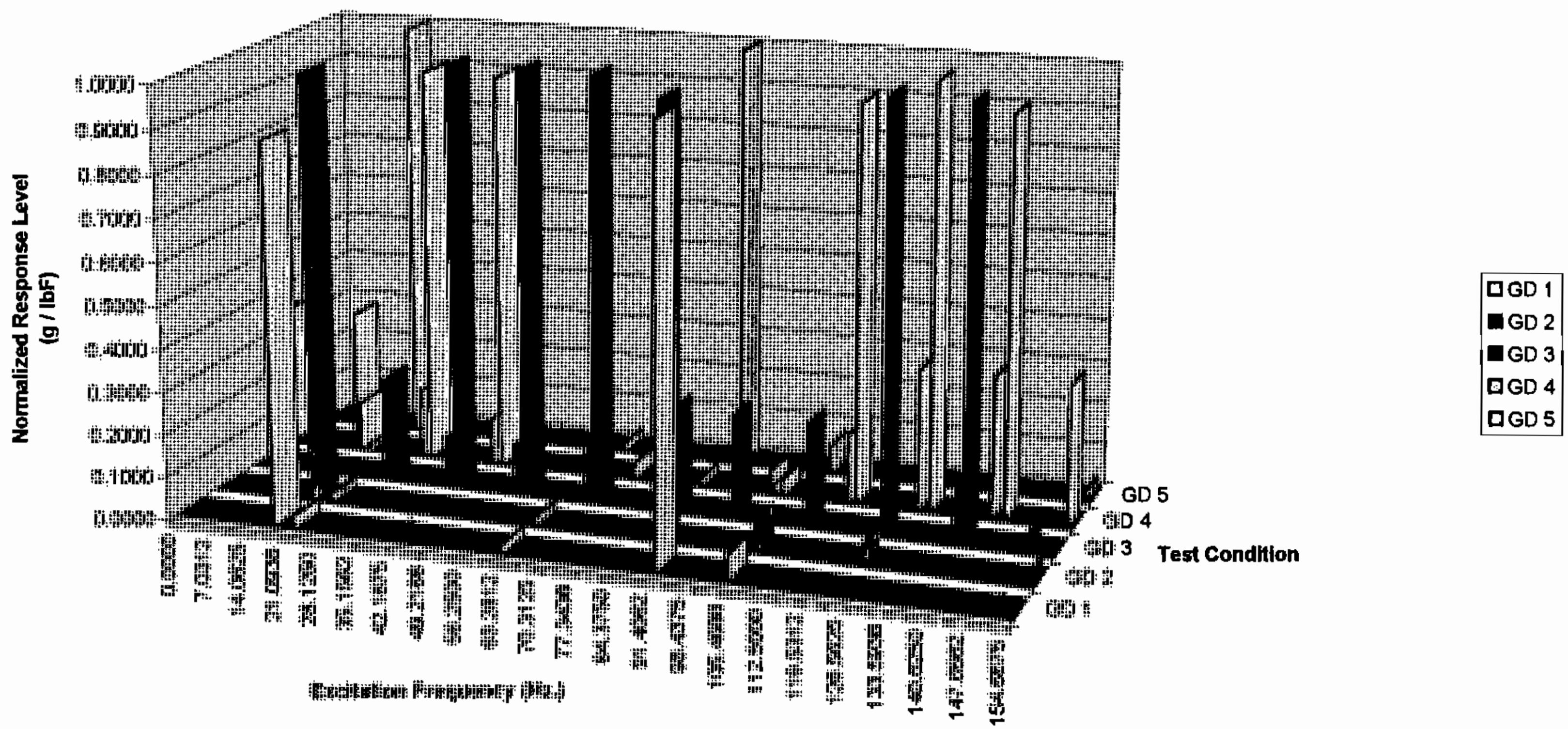
APPENDIX B
FREQUENCY RESPONSE / MODAL DAMPING TEST DATA

The following figures provide a graphical representation of the frequency response and damping level data obtained at test locations GD 1 through 5 along the San Diego First Aqueduct alignment. The extracted values levels are quantum in nature and only occur where a local resonance (or peak in the frequency response plot) was noted.

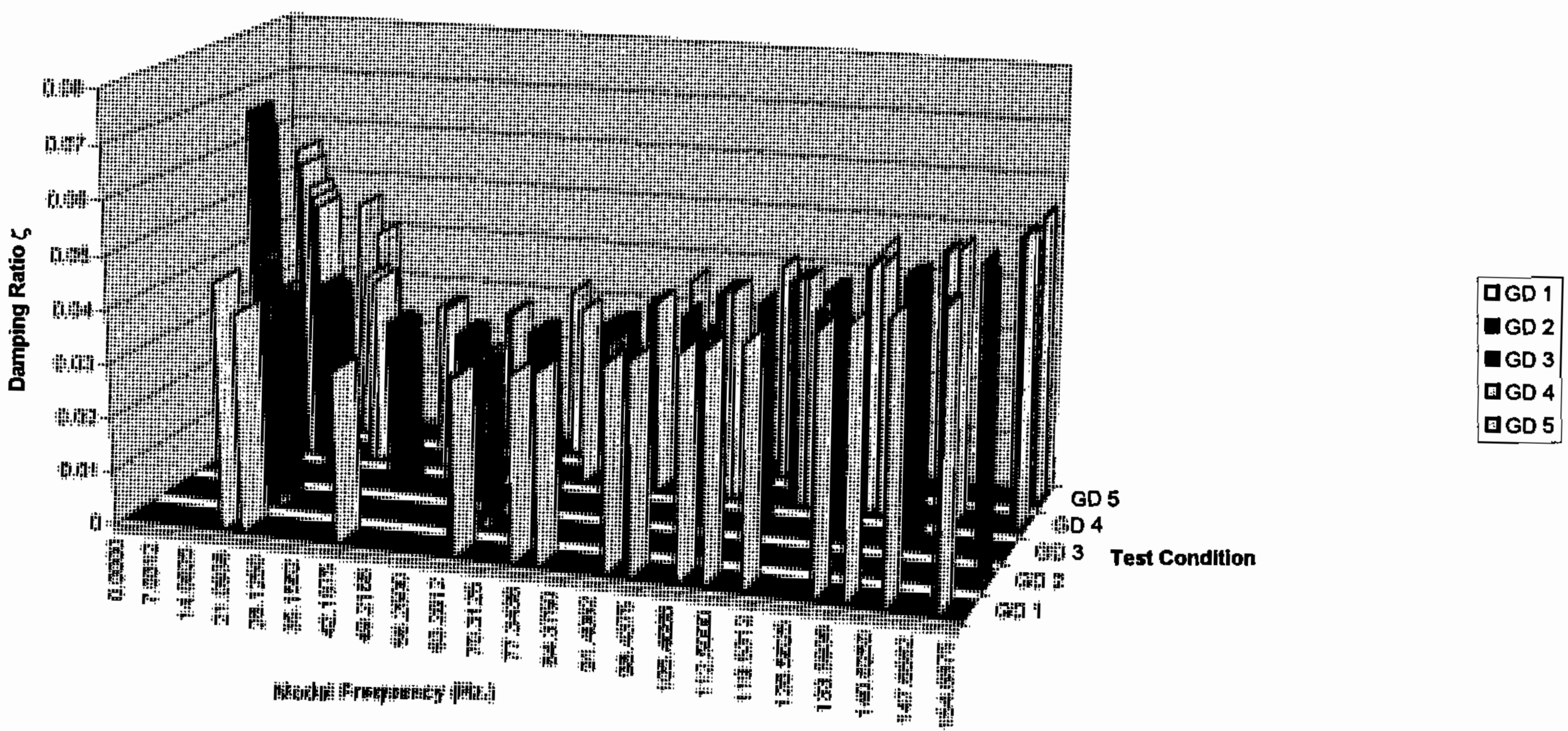
The measurement locations correspond to the actual aqueduct portal survey markers present at the site. They are referenced below and shown graphically in Figure 3 in the main report.

- GD 1: Measurement @ 2080+63.50
- GD 2: Measurement @ 2061+93.21
- GD 3: Measurement @ 1967+53.39
- GD 4: Measurement @ 1956+48.31
- GD 5: Measurement @ 1950+51.93

Identified Modal Resonances (GD 1 - GD 5)



Extracted Ground Damping Ratios (GD 1 - GD 5)



APPENDIX C

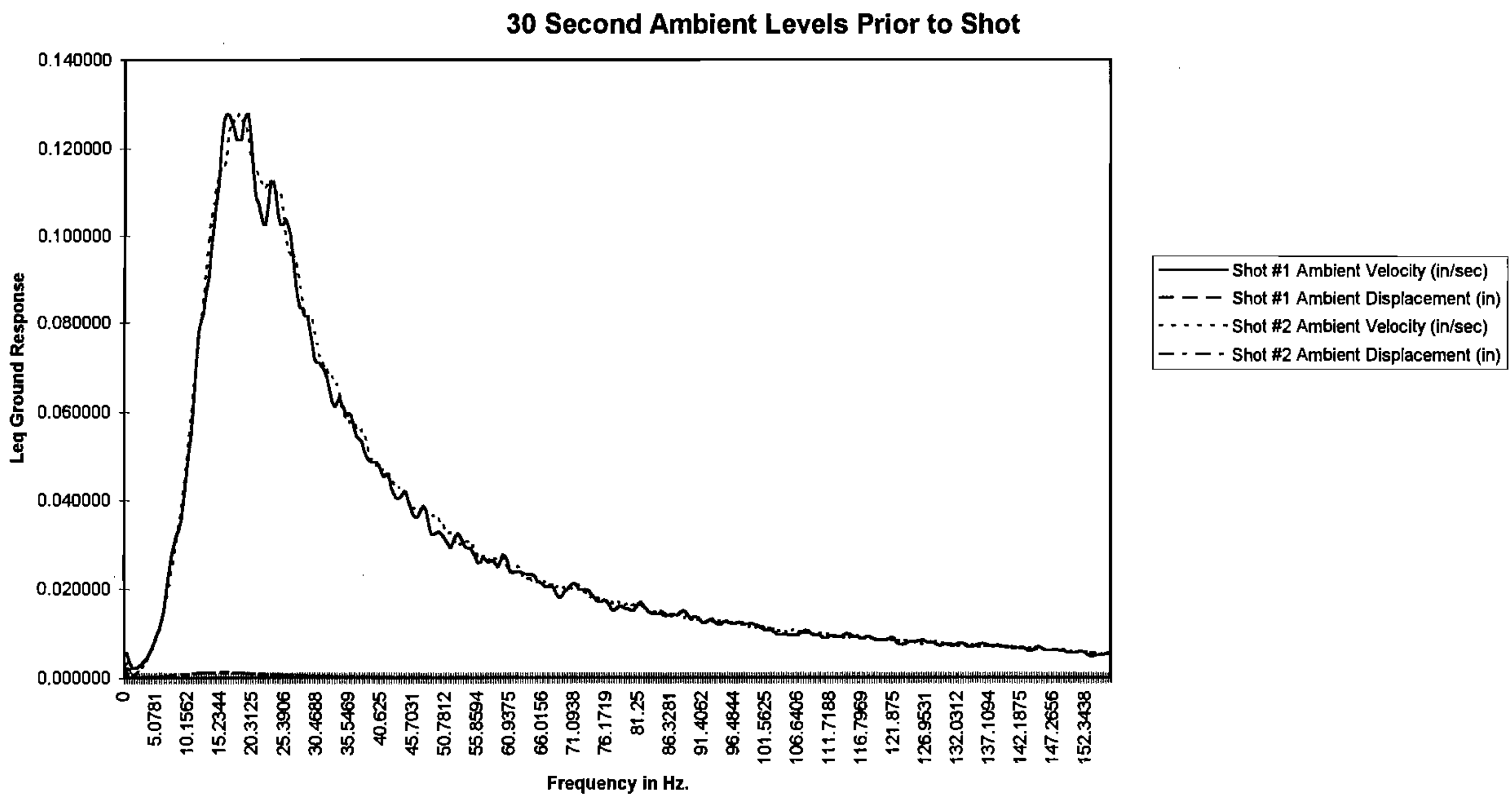
TEST BLAST GROUND RESPONSE DATA

APPENDIX C
TEST BLAST GROUND RESPONSE DATA

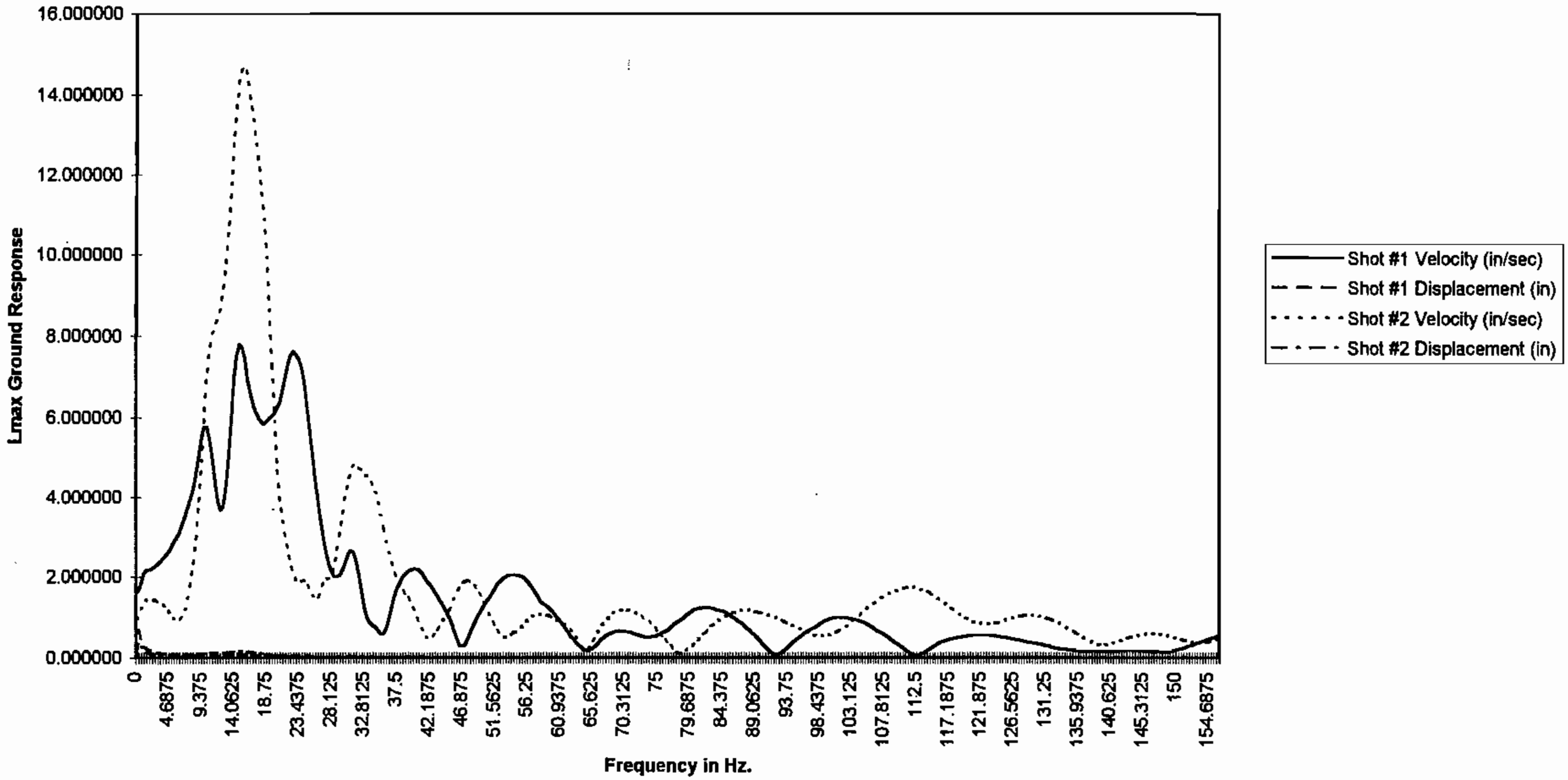
The following figures provide a graphical presentation of the ground response recorded during the two test blasts at Gregory Canyon on February 23, 1996. Each shot contained approximately 30 pounds of high explosive (Ammonium Nitrate-Fuel Oil or ANFO) and was completely confined at a depth of 25 feet. The specifics of the blasts were:

- Shot #1: Recorded at 10:03 a.m. at a distance of 125 feet from the monitoring point. Dual peak response of approximately 8.0 inches per second peak particle velocity measured at 14 and 24 Hz.

- Shot #2: Recorded at 10:19 a.m. at a distance of 100 feet from the monitoring point. Single peak response of approximately 14.5 inches per second peak particle velocity measured at 15 Hz.


30 Second Ambient Levels Prior to Shot
Leq Ground Response
0.140000
0.120000
0.100000
0.080000
0.060000
0.040000
0.020000
0.000000
0
5.0781
10.1562
15.2344
20.3125
25.3906
30.4688
35.5469
40.625
45.7031
50.7812
55.8594
60.9375
66.0156
71.0938
76.1719
81.25
86.3281
91.4062
96.4844
101.5625
106.6406
111.7188
116.7969
121.875
126.9531
132.0312
137.1094
142.1875
147.2656
152.3438
Frequency in Hz.
Shot #1 Ambient Velocity (in/sec)
Shot #1 Ambient Displacement (in)
Shot #2 Ambient Velocity (in/sec)
Shot #2 Ambient Displacement (in)

Instantaneous Maximum Particle Levels



APPENDIX D

GROUND VIBRATION ZONE OF INFLUENCE CURVES

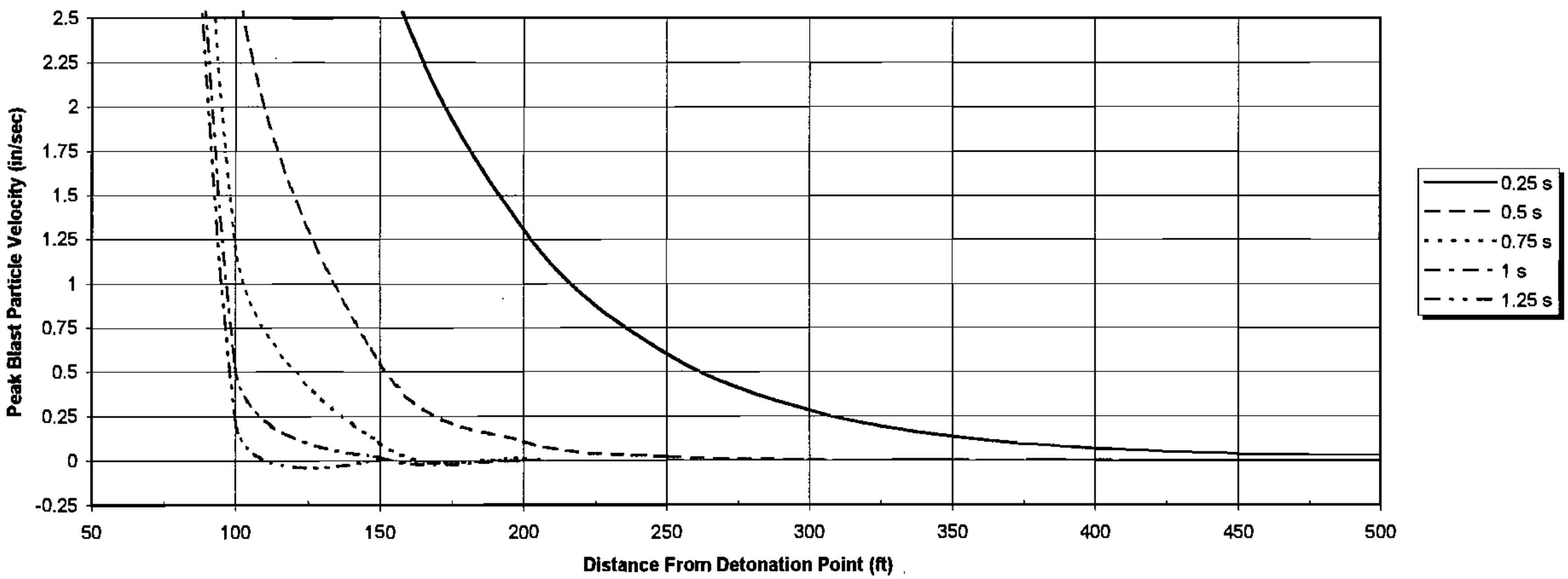
APPENDIX D
GROUND VIBRATION ZONE OF INFLUENCE CURVES

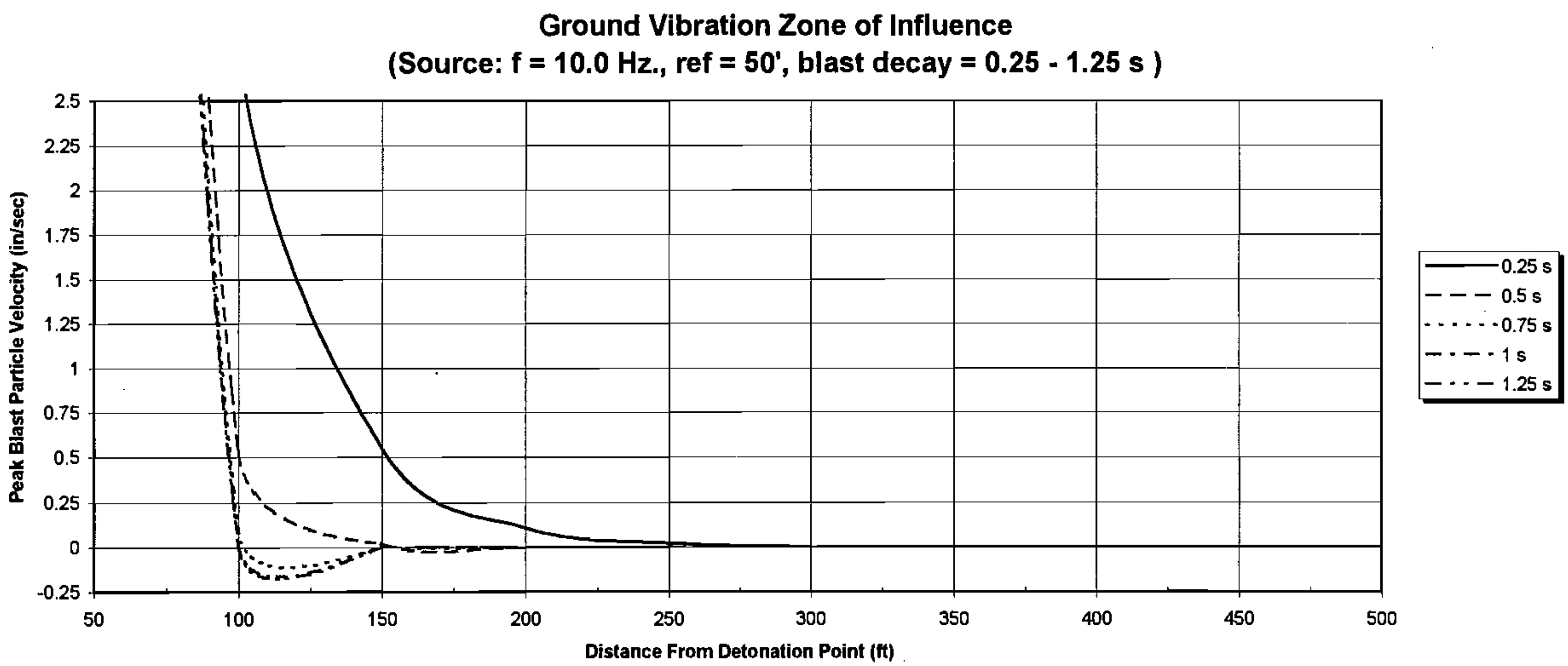
The following figures provide a graphical representation of the calculated zones of vibratory influence for the Gregory Canyon Landfill site along the San Diego First Aqueduct alignment.

The curves are generated for a reference peak blast particle velocity of 15 inches-per-second at a reference distance of 50 feet. A small-strain damping ratio of 4.24 % at 20 feet (average of sites GD 1 through -5) or 0.0021 per foot was taken.

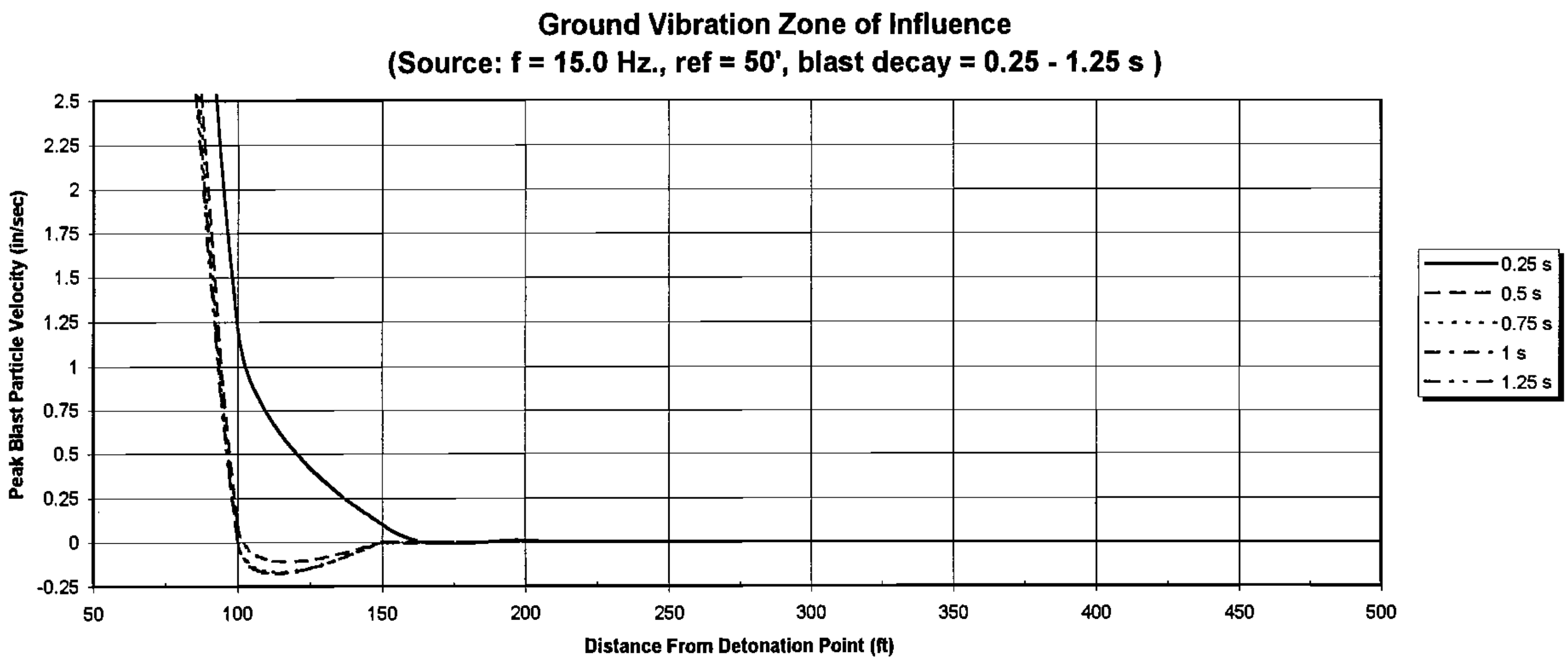
Influence curves are shown for burn delays ranging from 0.25 seconds to 1.25 seconds as a function of peak particle velocity versus decay distance over the a blast frequency content range of 5.0 to 40.0 cycles per second (Hertz, or Hz.).

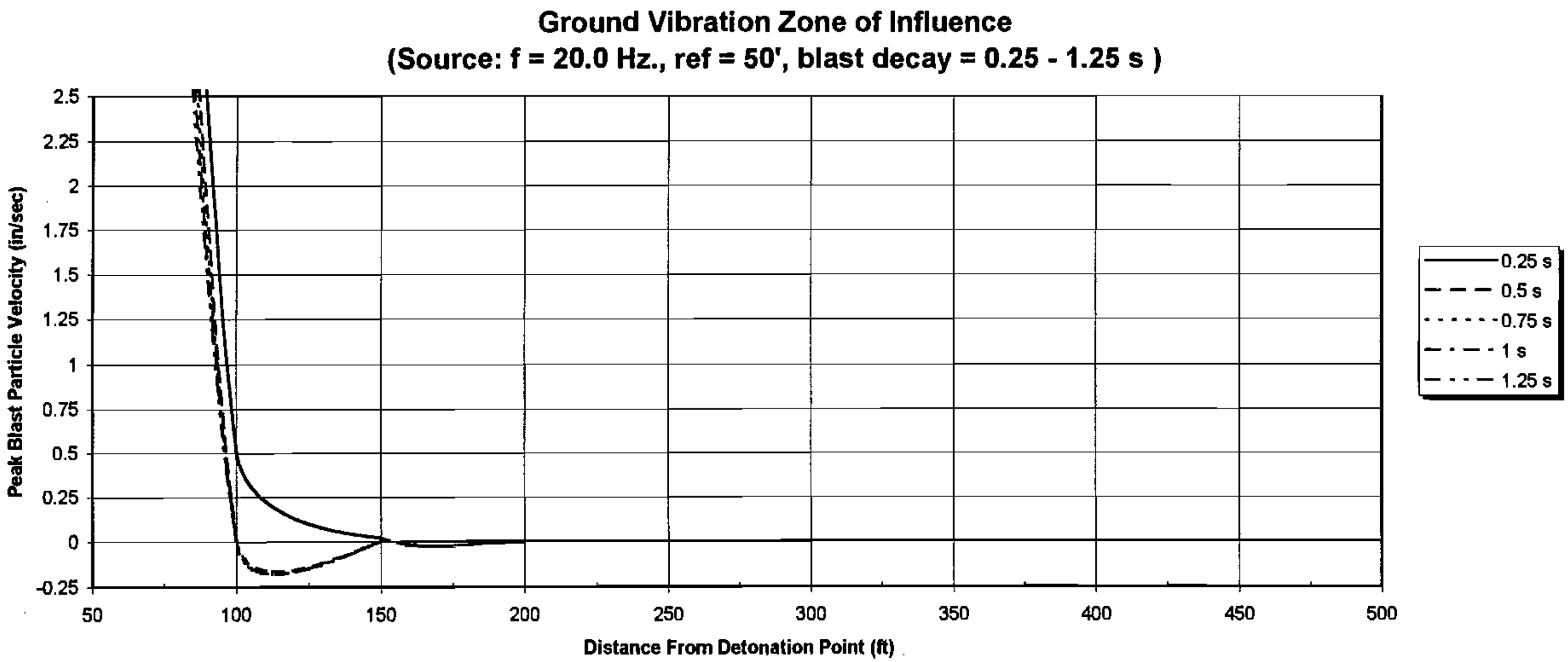
Ground Vibration Zone of Influence
(Source: f = 5.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)



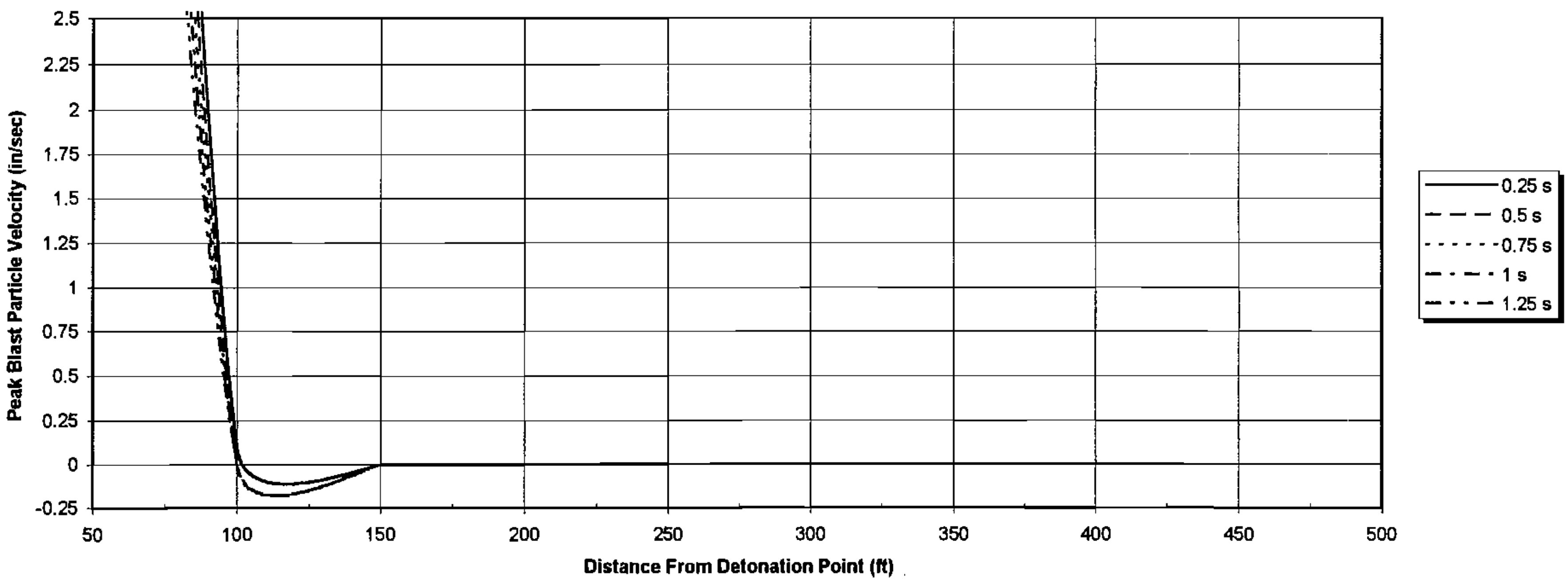


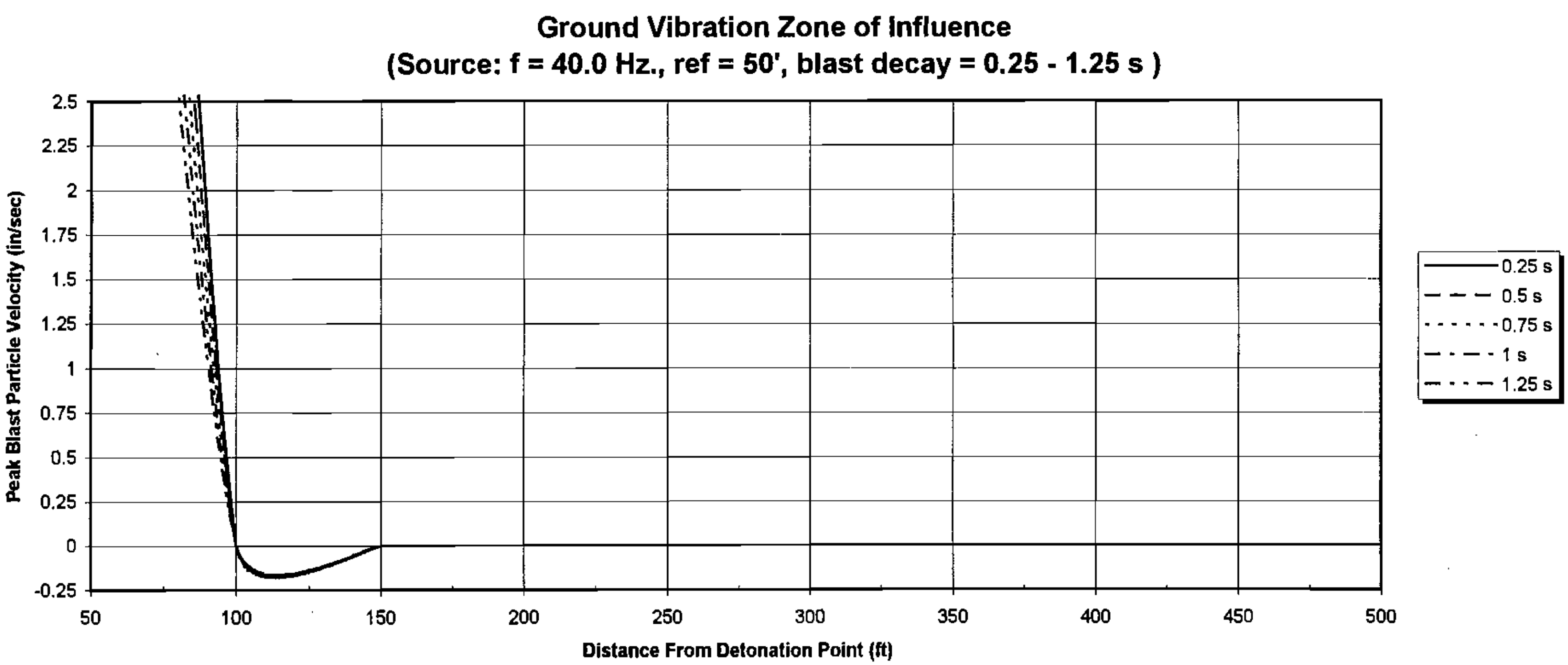
Ground Vibration Zone of Influence
(Source: f = 10.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)
Peak Blast Particle Velocity (in/sec)
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.25
50
100
150
200
250
300
350
400
450
500
Distance From Detonation Point (ft)
0.25 s
0.5 s
0.75 s
1 s
1.25 s


Ground Vibration Zone of Influence
(Source: f = 15.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)
Peak Blast Particle Velocity (in/sec)
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.25
50
100
150
200
250
300
350
400
450
500
Distance From Detonation Point (ft)
0.25 s
0.5 s
0.75 s
1 s
1.25 s


Ground Vibration Zone of Influence
(Source: f = 20.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)
Peak Blast Particle Velocity (in/sec)
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.25
50
100
150
200
250
300
350
400
450
500
Distance From Detonation Point (ft)
0.25 s
0.5 s
0.75 s
1 s
1.25 s

Ground Vibration Zone of Influence
(Source: f = 30.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)




Ground Vibration Zone of Influence
(Source: f = 40.0 Hz., ref = 50', blast decay = 0.25 - 1.25 s)
Peak Blast Particle Velocity (in/sec)
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.25
50
100
150
200
250
300
350
400
450
500
Distance From Detonation Point (ft)
0.25 s
0.5 s
0.75 s
1 s
1.25 s

APPENDIX E

STANDARD GLOSSARY OF TERMS

APPENDIX E

STANDARD GLOSSARY OF TERMS

Term	Definition
Accelerance	A response parameter indicating the amount of acceleration present at a point as a function of time. Also known as inertance, its inverse is called "apparent mass".
Acceleration Vector $\ddot{x}$	A physical quantity describing the magnitude of an acceleration at a point as well as its direction.
Accelerometer	An electromechanical device, typically constructed out of a piezoelectric material, capable of converting mechanical acceleration into an electrical signal.
Apparent Mass	A fictitious quantity relating the applied force to the amount of measured acceleration. See also *accelerance.*
Attenuation	The amount of signal loss during transmission.
Auto Power Spectrum	A type of spectrum where the signal power of the input signal is displayed.
Coherence	A measure of the signal-to-noise ratio.
Cross Power Spectrum	A type of spectrum where the signal power from the input signal is compared against the signal power of the output signal.
Damping	A physical quantity which describes the ability of a vibrating system to loose energy during an oscillation.
Differential Equation	A mathematical equation containing variables and their derivatives.
Displacement Vector x	A physical quantity describing the magnitude of a displacement as well as its direction.
Dynamic Stiffness	A fictitious quantity relating the applied force to the amount of measured displacement. See also *receptance.*

Term	Definition
Excitation	Any source of input energy (either displacement or force) which sets a vibrating body into motion.
Fast Fourier Transform, FFT	A mathematical transformation which converts a time domain signal into the frequency domain.
Filter	A device (either electrical or mathematical) which removes unwanted signal content.
Frequency Domain	Any quantity which is a function of frequency.
Frequency Response Function	Another name for transfer function.
Fundamental Frequency	The first natural frequency of a vibrating system.
Impact Hammer	A mechanical excitation device in the shape of a hammer. The input energy is measured via a force transducer inside the hammer.
Inertia	According to Newton, "That quantity which opposes motion of a body."
Lattice Structure	The molecular construction arrangement of a particular material. The arrangement of molecules is similar to a child's "tinker-toy" assembly.
Load Cell	An electromechanical device constructed out of piezoelectric material capable of producing a faint electrical signal as a result of an applied force.
Mass	A property of a physical system which by its presence gives rise to the systems weight.
Mechanical Impedance	A fictitious quantity relating the applied force to the amount of measured velocity. See also *mobility*.
Mobility	A response parameter indicating the amount of velocity present at a point as a function of time. Its inverse is called "mechanical impedance".

Term	Definition
Modal Analysis	A type of non-destructive testing where the vibratory behavior, or modes, are obtained.
Natural Frequency	A frequency of natural (or non-excited) motion of a body.
Newton's First Law of Motion	Known as the Law of Inertia, it states that "... an object in motion will remain in motion, and an object at rest will stay at rest."
Newton's Second Law of Motion	This Law relates the amount of force (F) an object experiences to the objects mass (m) and acceleration (a). Mathematically this is given as: $F = ma$. (F) and (a) can be either scalars or vectors.
Newton's Third Law of Motion	Known as the Law of "action-reaction", it states that "... for every action (force) there is an equal and opposite reaction."
Oscillatory	Another name for vibratory motion.
Piezoelectric Crystal	A mineral crystal, typically quartz, which produces a faint electrical charge when an outside pressure is applied.
Power Spectrum	A type of spectrum where the signal power as a function of density is displayed.
Receptance	A response parameter indicating the amount of displacement present at a point as a function of time. Its inverse is called "dynamic stiffness".
Resonance	A oscillatory condition of a system where the frequency of the input excitation is close-to or equal-to one of the systems natural frequencies. Excessive amounts of displacement can occur during this condition.
Response	The desired output of a vibrating system. This is either the accelerance, mobility, or receptance.
Scalar	A physical quantity which has magnitude only.

Term	Definition
Spectrum Analyzer	An electronic device which can take an electric signal (e.g., from an accelerometer) in the time domain and convert it into the frequency domain. See also *Fast Fourier Transform* or *FFT*.
Stiffness	A property of a physical system which provides a "restoring force" and allows it to store vibratory energy.
Time Domain	Any quantity which is a function of time.
Transfer Function	A mathematical relationship describing the output of a system as a function of the its input.
Vector	A physical quantity which has magnitude and direction.
Velocity Vector $\dot{x}$	A physical quantity describing the magnitude of the velocity at a point as well as its direction.
Viscous Isolation	A type of damping system where viscous "or liquid-like" materials are used to isolate the excitation force from the system.

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December 4, 1998 (Revised)

Ms. Luci Hise
David Evans and Associates
23382 Mill Creek Drive, Suite 225
Laguna Hills, CA 92653

Re: Ground Vibration Addendum Study – Gregory Canyon Landfill Project (ISE Report #98-016)

Dear Ms. Hise:

At the request of the David Evans and Associates (DEA) and Gregory Canyon Limited, Investigative Science and Engineering (ISE) was directed to prepare an addendum engineering evaluation pertaining to potential ground motion impacts to nearby sensitive receptors due to blasting construction activities at the Gregory Canyon Landfill site.

This report is intended to supplement the earlier findings presented in a previous technical report for the project site (*Vibration Technical Report on Construction Blasting Operations at the Gregory Canyon Landfill, Pala California, Ogden 3/7/96*) by examining the potential impacts to nearby residences and existing San Diego Gas and Electric (SDGE) transmission towers. A field survey of the site was performed on August 14, 1998. The results of that survey and any revised mitigation plans are presented in this letter report.

Introduction and Definitions

Site Characterization / Project Description

The proposed project consists of the construction, operation, and ultimate closure of a new Class III solid waste landfill at Gregory Canyon, located in northeastern San Diego County near the community of Pala, approximately three and one-half miles east of the I-15 and SR-76 intersection. The project area includes an access road and bridge, entrance facilities, administration and maintenance facilities, recycling facilities, and relocation of SDGE transmission towers and the possible relocation of the San Diego First Aqueduct Pipelines 1 and 2. The proposed project is located on a 1,770 acre privately owned site, which is under a purchase option agreement with Gregory Canyon Ltd. The site consists largely of undisturbed steep canyon walls which flattens at the mouth of the canyon where it meets alluvial deposits of the San Luis Rey River Drainage.

The area occupies portions of Section 4 and 5 of Township 10 South and Sections 32 and 33 of Township 9 South of the County of San Diego, and is located on Range 2 west of the USGS 7.5' Pala Quadrangle. Elevations of the area range from 1,200 feet MSL at the head of the canyon to the south to 300 feet MSL at the mouth of the canyon adjacent to the San Luis Rey River. A prominent knoll extends into the river drainage on the west side of the canyon mouth. The regional location of the project site is shown below in Figure 1A.

Blasting is expected at the Gregory Canyon Landfill site since recent geologic surveys of the area indicate dense underlying rock structures with high shear velocities (GLA, 1995-1998). Vibration associated with blasting is dependent on the amount and type of blasting material and the depth of the charge below the surface. A large fraction of the energy of the blast is absorbed through a plastic deformation mechanism within the rock (i.e., fracturing of the rock) with the remainder of the energy being converted to heat, mechanical vibrations in the rock, and sound vibrations in the air. Vibrations emanating from a blast are generally characterized as being low frequency (i.e., less than 40 Hz.) with the dominant energy present below 20 Hz.

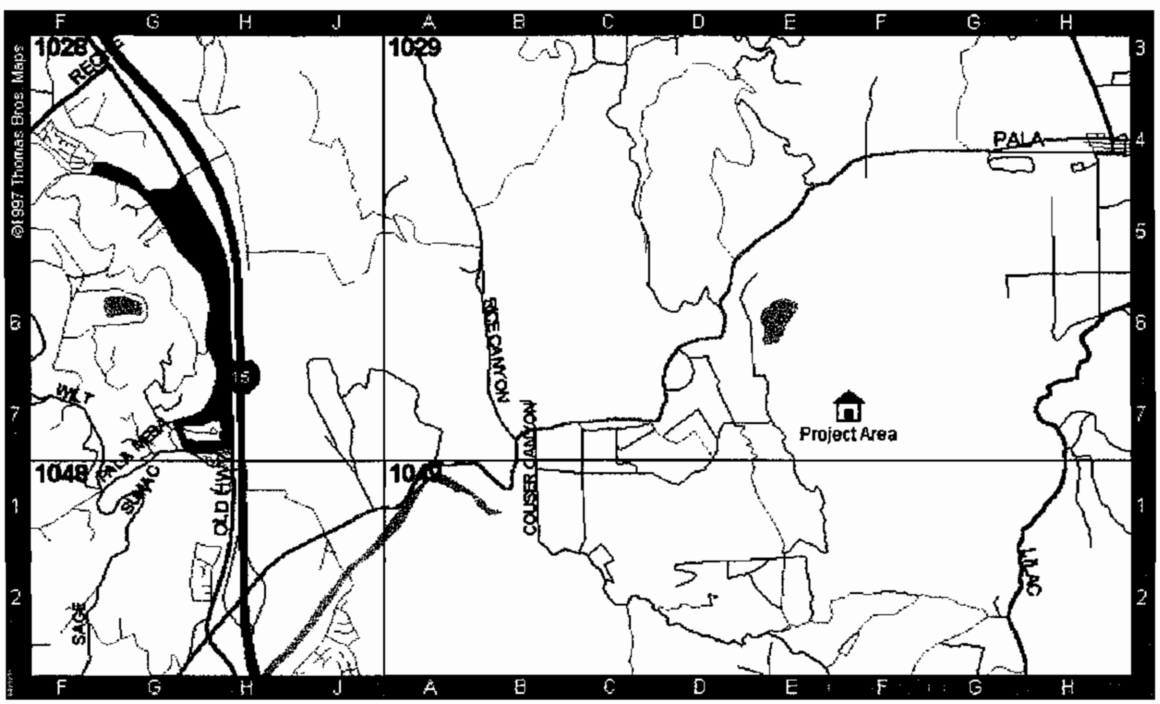


Figure 1A: Project Vicinity Map (Thomas Guide Page 1029, Grid F7)

Earlier ground motion concerns have centered around impacts due to construction blasting activities at the proposed landfill site adjacent to the San Diego First Aqueduct (Pipelines 1 and 2). The previous ground motion study (Ogden 1996) addressed the effects of blasting on the subterranean pipelines and proposed a safe blasting distance based upon assumed charge per delay levels and accepted damage threshold criteria. Any blasting which occurred under these circumstances was found to have a negligible impact on the aqueduct structure.

This report extends the previous analysis by utilizing the same methods to predict possible impacts to nearby residential structures located near the head of the canyon as well as to the existing SDGE power transmission corridor located onsite. This report will also briefly address the previous blasting study pertaining to its continued applicability as well as comment on the apparent instability of existing rock structures to the immediate east of the project site.

Technical Definitions

The study of wave phenomenon produced by a blasting event is identical to the study of wave motion produced by earthquakes and hence falls under the general classification of seismology. The general class of problems seeks to predict the vibratory response (at a point) due to some type of excitation (either blasting or earthquakes). The solution strategy employed in this technical report will seek to model the wave response due to blasting in a simpler and more computationally efficient manner identical to that examined in the previous technical report with negligible loss in accuracy for the type of problem examined. For the purposes of brevity, the reader is referred to the previous technical study for a complete description of the general problem class. As with the previous study, we will confine our analysis to predicting the decay distance of transverse waves.

Vibration itself is generally defined as any oscillatory motion induced in a structure or mechanical device as a direct result of some type of input excitation. The object (either structure or machine) of interest typically has sufficient inertia so that its rest state is one of zero vibration. Input excitation, generally in the form of an applied force or displacement, is the mechanism required to start some type of vibratory response.

For most practical applications, induced mechanical or structural vibrations are a thing to be avoided since they are generally unwanted and according to their magnitude can produce physical discomfort, misalignment of equipment, loosening of mechanical fasteners, product defects, and skewed research results. In the case where the excitation frequency is close to resonance or of sufficient magnitude (such as in an earthquake), severe structural damage can occur.

Vibrations are commonly measured using a device known as an accelerometer. This device consists of a small piezoelectric crystal shaped in such a fashion so as to produce a small electrical charge when it is vibrated. This electrical charge is then transmitted via a cable assembly into a spectrum analyzer, which displays the frequency content and magnitude of the electrical signal. By calibrating the accelerometer's output signal, the electrical signal then becomes a direct representation of the vibration present and hence indicates the acceleration, velocity, and/or displacement present at the point of interest.

Applicable Impact Criteria

The following ground motion impact criteria is repeated here for reference. The original citation can be found in the previous technical report.

County of San Diego Vibration Standards

Section 6314 ("Vibration") of the County of San Diego Zoning Ordinance provides maximum permissible vibration displacement levels for various land use categories. These standards are only for commercial and industrial sources (i.e., fixed operating machinery) and do not apply to construction blasting. There are currently no specific blasting vibration criteria for the County of San Diego. Typically, a specific structural design is based upon prudent engineering judgment, analytical verification, and coherence with a Uniform Building Code (UBC).

U.S. Bureau of Mines RI 8507 Blasting Criteria

The U.S. Bureau of Mines in its report RI 8507, *Structure Response and Damage Produced by Ground Vibrations from Surface Blasting*, has identified acceptable maximum transverse ground velocity levels. This criteria sets the maximum peak particle velocity as a function of frequency. The results are summarized in Table 1 below. It has been shown by the Bureau of Mines that these vibratory excitation levels would produce negligible effects (displacement, fatigue, and damage) in conventionally constructed structures (i.e., structures built within the past 100 years).

Analysis Methodology

Free Vibration (Ambient) Ground Response

The analysis methodology herein is identical to that employed in the previous technical report. That is, the ambient vibration level was determined at three monitoring locations along the rear access road at the head of Gregory Canyon. These locations corresponded to equally spaced points along the roadway adjacent to the three closest residential receptor locations within the 1,000 foot survey radius behind the proposed landfill.

Table 1 - US Bureau of Mines RI 8507 Standards

Blast Frequency Component (*f*) (Hz.)	Maximum Allowable Peak Particle Velocity (inches per second)
2.5 to 10.0	0.05
11.0 to 40.0	0.05 x *f*
> 40.0	2.0

The maximum allowable peak particle velocity for the range of frequencies between 11.0 and 40.0 Hz. is limited to a value of 0.05 times the dominant blast frequency.

Groundborne vibration was recorded using a PCB Model 693C seismic accelerometer affixed to a steel mounting plate. The accelerometer was positioned to record vertical (z-axis) motion due to blast wave propagation. The accelerometer signal was fed into a second channel of the spectrum analyzer and numerically integrated to yield a velocity profile prior to being saved to disk.

Vibratory levels of displacement, velocity, and acceleration were gathered at each instrumentation point. These vibration monitoring locations (GF1A through GF3A) are shown graphically in Figure 2A. The test setup is shown in Figure 4, Part A, (with the hammer and force signal on the left part of the figure removed) of the previous technical report.

Forced Vibration (Modal) Ground Response

The relative amount of damping present at the SDGE transmission pad selected for testing was performed using a forced excitation method known as modal analysis. This two channel test required one channel (typically channel 2) to take its input from the same ICP accelerometer as during the free vibration measurement. The second channel (typically channel 1) obtained its input from a 12-pound calibrated modal sledge hammer. For the type of testing undertaken, the sledge hammer impacted the upper part of the support pier tested in a vertical (z-axis) direction which acted to transfer the energy from the hammer blow through the support column and into the ground. The accelerometer was positioned at a distance of 20 feet from the edge of the support column. The results measured were therefore for the combined column-soil system. The complete test setup is shown in Figure 4 of the previous technical report.

A GPS survey was performed at all measurement locations to spatially quantify test positions. A Magellan Model 2000 XL GPS with 12 channels of resolution was used to collect survey points and calculate the maximum Estimated Position Error (EPE). No differential corrections were applied to the data.

Findings

Impacts to Nearby Residential Receptors

The three ambient test locations are shown below in Table 2. Overall maximum root-mean-square (RMS) ground vibration levels were found to range between a very stable 0.0003 and 0.0004 in/sec. Typical ground-only damping levels have been shown to range between 2.0 to 3.0 percent of the critical level at 20 feet (Campella, et. al., 1994). Measurements performed by ISE in the past have verified the validity of this finding. Spectral plots for the three monitoring locations are provided as Figures 3A through 5A.

Assuming a worst case ground-only damping level of 2.0 percent at 20 feet gives a value of 0.0010 per linear foot. Utilizing the assumed blasting conditions identified in the previous report (i.e., an instantaneous open-faced blasting impulse of 15.0 inches per second at a reference distance of 50.0 feet, or approximately 34 pounds per 8 ms delay) and a dominant blast frequency of 18 Hz gives a distance of 155 feet before the blast wave drops below the RI 8507 threshold. Applying a margin of safety to this value gives an acceptable blast-receiver separation distance of approximately 230 feet. Since the nearest receptor is over 600 feet away from the closest possible blasting point, no significant ground motion impacts are indicated.

Table 2 - Measured RMS Ambient Vibration Levels

	GF1A	GF2A	GF3A
Acceleration (in/sec^2)	0.1097	0.0813	0.0787
Velocity(in/sec)	0.0003	0.0004	0.0004
Displacement (in)	0.0001	0.0001	0.0001

Monitoring Locations:

- GF1A: 33° 19.984N x 117° 06.691W, EPE 95 ft.
- GF2A: 33° 19.978N x 117° 06.473W, EPE 29 ft.
- GF3A: 33° 19.972N x 117° 06.351W, EPE 29 ft.

All positions recorded in NAD 83.

Impacts to SDGE Transmission Facilities

The existing SDGE transmission towers located along the eastern edge of the canyon are approximately 200 foot-high steel truss assemblies secured at four locations atop concrete support piers. The truss structure itself is a pined assembly having very little damping due to its all-steel construction. Small motions imparted to the base of the structures would be dispersed throughout the structure with a resulting translation of the top of the tower. This translation would effectively "pull" on the transmission lines suspended between the towers possibly damaging the ceramic stand-offs. Larger motions would produce the potential for brittle shear of the support columns with a subsequent reduction of load carrying capacity of the member.

The relative damping level between the soil and the support pier is the principal mechanism to remove unwanted ground motion from the tower structure. This damping level was extracted using the Half-Power-Point-Method. A complete description of the method is provided in the previous report. In essence, the method attempts to calculate the relative amount of damping present in a particular mode (peak of the response signature) by examining the "sharpness" of the individual peaks. The sharper the peak, the smaller the amount of damping present.

Damping levels associated with the various test trials is shown below in Table 3. Overall the levels were slightly less than those previously seen for the First Aqueduct alignment. This is to be expected since the support piers are smaller and lighter than the aqueduct portals and are of one solid piece.

Table 3 - Extracted Damping Levels at SDGE Support Pier

Test Trial	Percent of Critical Damping Level ζ (%)	Separation Distance of Excitation and Receiver Points	Damping Level per Linear Foot ζ / ft
1 (SE Pier)	3.16	20 feet	0.0015
2 (NE Pier)	3.04	20 feet	0.0015
3 (SW Pier)	3.27	20 feet	0.0016
4 (NW Pier)	3.18	20 feet	0.0016
5 (SE Pier)	3.21	20 feet	0.0016

Notes:

- SDGE tower tested: 33° 20.002N x 117° 06.273W, EPE 36 ft.
- Calculated over experimental frequency range of 0.00 to 154.68 Hz.
- Includes rigid-body pier-soil interaction.
- Test trial 5 was performed as a data check.

The results show that an average damping ratio of roughly 3.17 percent was present during all five tests. This level is consistent with the surface composition (to the depth of the pier) of this area which is unconsolidated and readily dampens vibratory energy.

Employing a method identical to that above, the same assumed instantaneous blasting impulse of 15.0 inches per second was applied as the source excitation. The graphical results of the modeling are provided as an attachment to this report. Table 4 shows the minimum predicted distance (*Minimum Blast Distance from SDGE Pier for Compliance*) and gives a measure of the linear distance required to meet the Bureau of Mines RI 8507 standards. The last column of Table 4 (*Recommended Minimum Blasting Distance from SDGE Pier*) incorporates a 1.5 factor of safety to account for experimental and construction blasting errors. For the purposes of impact determination, the 0.25 second blast decay curve was taken as the response curve of choice. Hence, this analysis represents a worst-case analysis.

Based upon these findings, the minimum blast separation distance would be 135 feet. This value rises to 814 feet for a pure 5 Hz source wave. Since the dominant frequency of the test blast identified in the previous report was 18 Hz, an impact distance of roughly 150 feet would be an acceptable exclusionary distance for blasting operations.

Table 4 - Recommended Minimum Allowable Blasting Limits from SDGE Transmission Corridor

Primary Blast Frequency Content	Bureau of Mines RI 8507 Maximum Allowable	Minimum Blast Distance from SDGE Pier for Compliance	Recommended Minimum Blasting Distance from SDGE Pier (MS=1.5)
5 Hz.	0.05 in/sec	543 feet	814 feet
10 Hz.	0.05 in/sec	285 feet	427 feet
20 Hz.	1.0 in/sec	95 feet	142 feet
30 Hz.	1.5 in/sec	92 feet	138 feet
40 Hz.	2.0 in/sec	90 feet	135 feet

Notes:

- Minimum blast distance based upon a maximum measurable instantaneous ground disturbance of 15.0 inches/second PPV measured at a reference distance of 50.0 feet from the detonation point.
- A frequency independent small-strain material damping ratio of 0.0016 per foot was used and is based upon empirical measurements. This level accounts for local support pier-soil interaction.
- Decay curves based upon a 0.25 second wave decay rate.

Applicability of Previous Report Findings

The previous report identified damping factors for the aqueduct-soil system as having an average level of 4.24% (or 0.0021 per linear foot). Low frequency modal activity (associated with rigid transverse motion of the portals and tunnel segments was found to occur around 18 to 22 Hz. Higher identified dynamic activity was associated with local motion of the portal itself. Based upon these physical parameters, the response of a single velocity input of 15.0 inches per second at a reference distance of 50.0 feet yielded a minimum safe open-faced blasting distance of 750 feet for a purely 5.0 Hz wave. This value dropped to 132 feet as the frequency content of the blast wave was increased to 40.0 Hz. The predicted blast separation distance at the test frequency of 18 Hz was approximately 150 feet with the included margin of safety of 1.5. These distances formed the zone of influence due to blasting interaction along the aqueduct alignment.

Based upon ISE's examination of the project site, and testing performed on similar structures (i.e., the SDGE transmission tower support piers) the previous recommendations of the earlier report appear to still be valid. No physical items were identified during the most recent field investigation that would point to the contrary.

Potential Problems with Overhanging Rocks

A cursory visual examination of the rock structures located on the hillside to the immediate east of the landfill canyon showed what appeared to be several unstable rock masses (i.e., large boulders) held in position along the hillside by mere static friction between the rock and ground surface. Although these rock structures for the most part appear to be resting at an angle which is less than the natural *angle of repose* (i.e., the maximum hillside angle before slippage occurs) there still exists the potential for some of these structures to freed due to proposed blasting operations. The consequences to worker health and safety are obvious.

Conventional wisdom typically dictates that a pre-blast survey of these rocks be performed to determine whether or not they are part of the larger hillside or isolated units. Isolated rock masses are typically shot-in-place prior to landfill excavation blasting and allowed to fall within the proposed excavation basin.

Conclusions & Recommendations

Blasting operations of the type examined above were not found to produce impacts to nearby sensitive residential receptors, nor were applicable threshold criteria exceeded. No formal blasting mitigation measures would be required for blasting effects on nearby residential structures.

Blasting operations of the type examined above were found to produce impacts to existing SDGE transmission facilities and the existing First Aqueduct system. For the predicted 18 Hz. dominant blast wave a source-receiver separation distance of roughly 150 feet was required for both the SDGE facilities and aqueduct system respectively. This value is based on the fact that both the SDGE tower support piers and the aqueduct system had approximately the same level of soil-structure damping. It should be stressed that for blasting outside the bounds of this prediction (or for confined blasting), the levels shown in Table 4 of this report and the previous study should be used.

Should you have any questions regarding the above findings, please do not hesitate to contact me at (619) 592-7817.

Sincerely,

Rick Tavares, EIT, REA, INCE
Project Principal
Investigative Science and Engineering

Cc: John Conley, ISE

Attachments: Figure 2A: Free Vibration Monitoring Locations

Figures 3A – 5A: Ambient Ground Response at GF1A through GF3A

Ground Motion Model Results (15 in/sec blast, 3.17% damping, 0-40 Hz dominant wave)

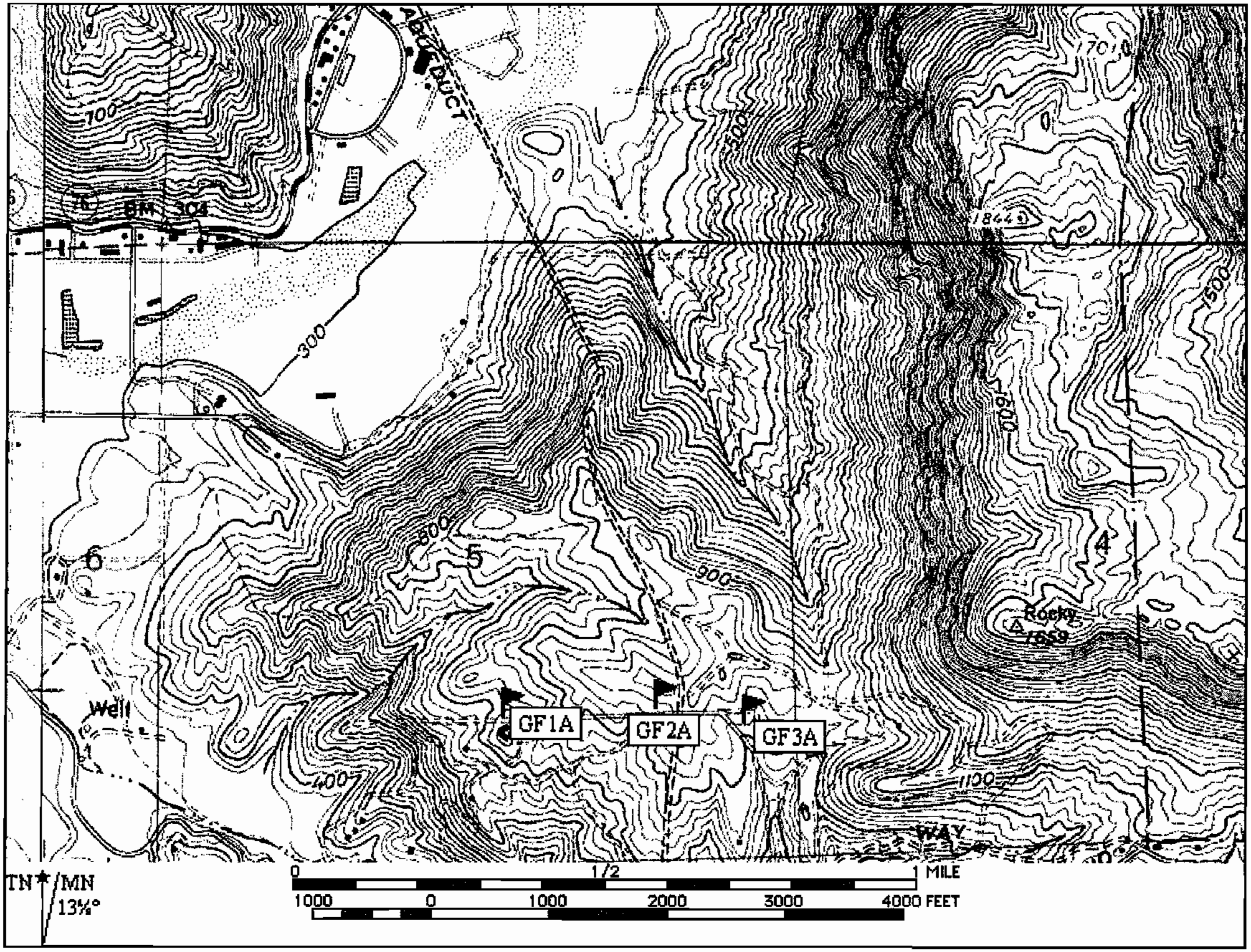


Figure 2A – Free Vibration Monitoring Locations (GF1A – GF3A)

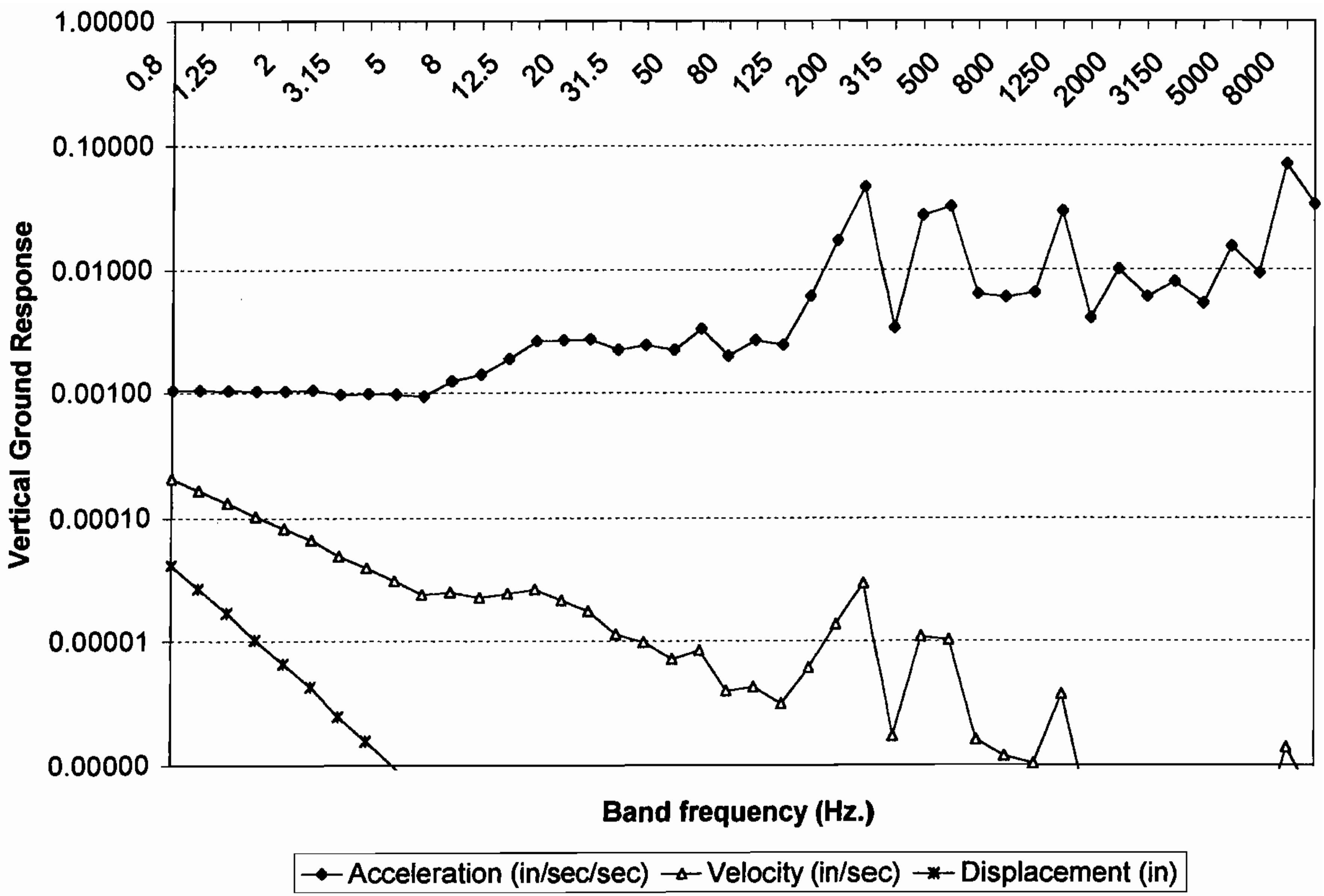


Figure 3A - Ambient Ground Response @ GF1A

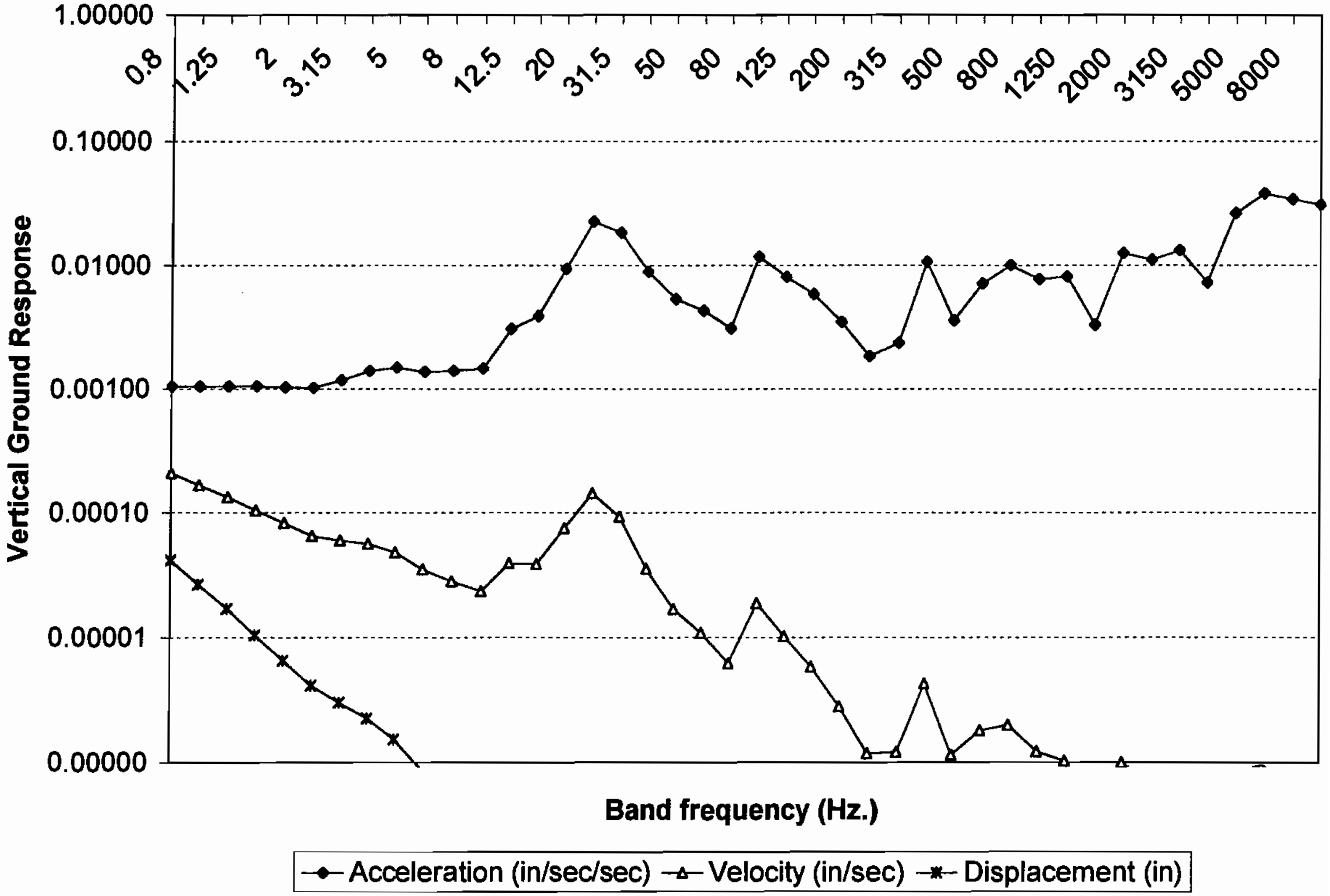


Figure 4A - Ambient Ground Response @ GF2A

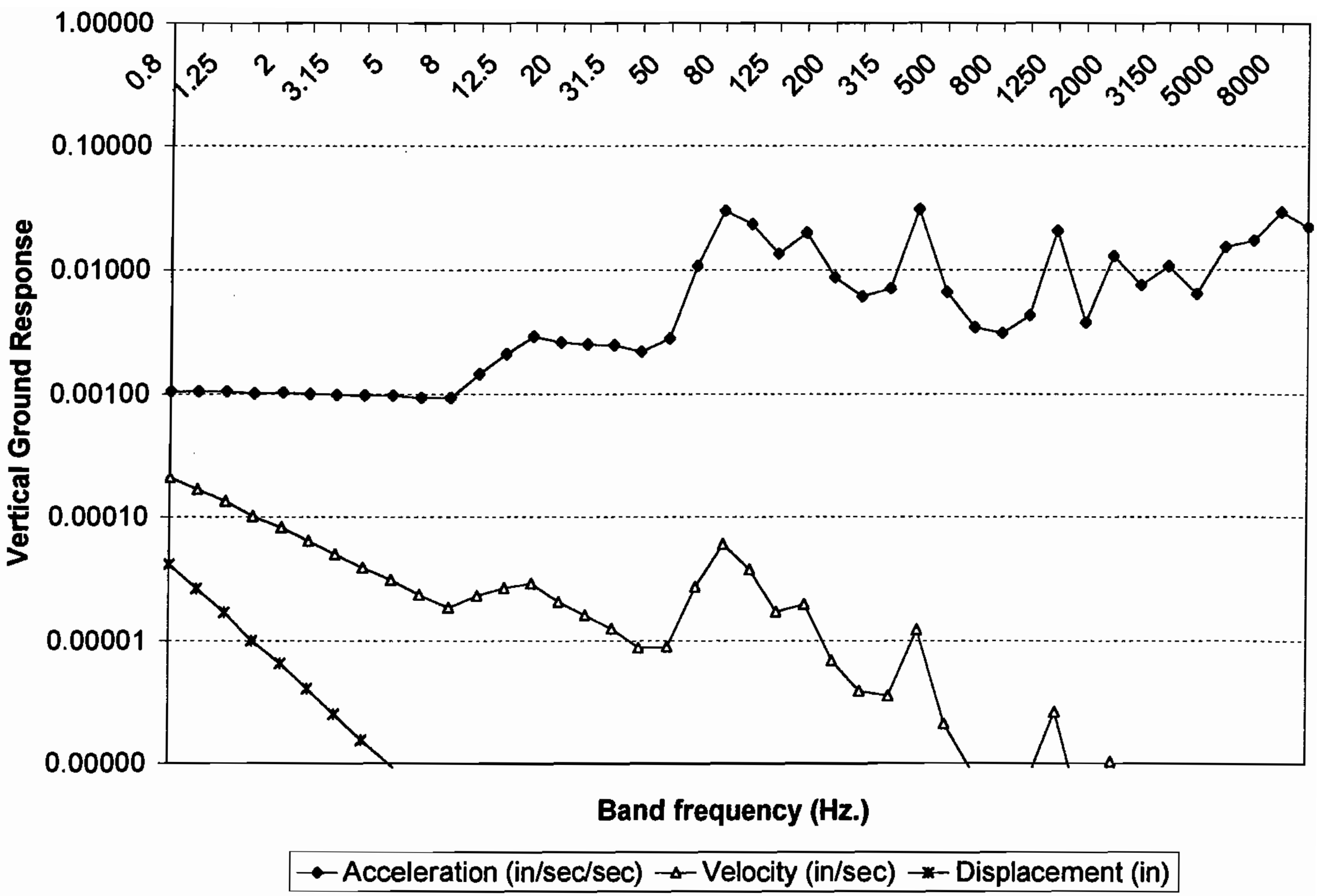
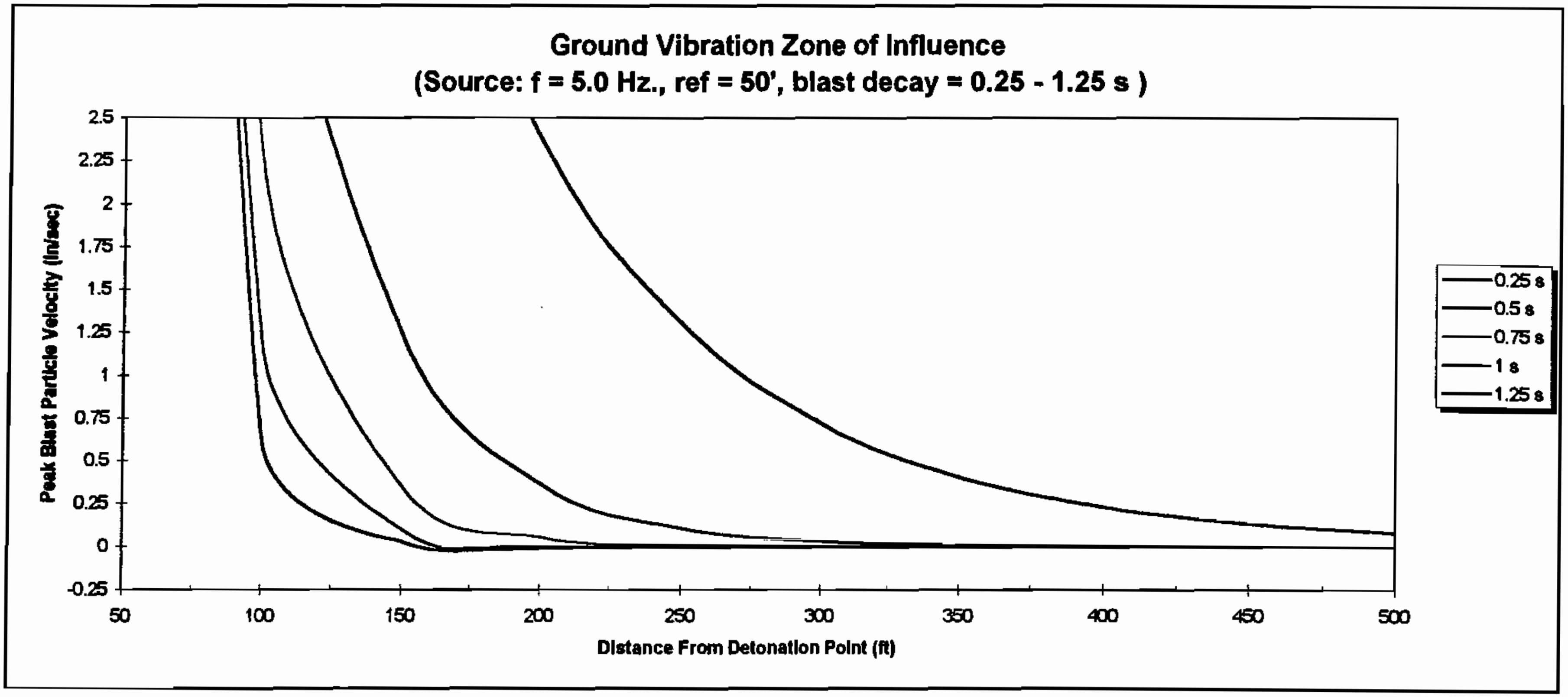
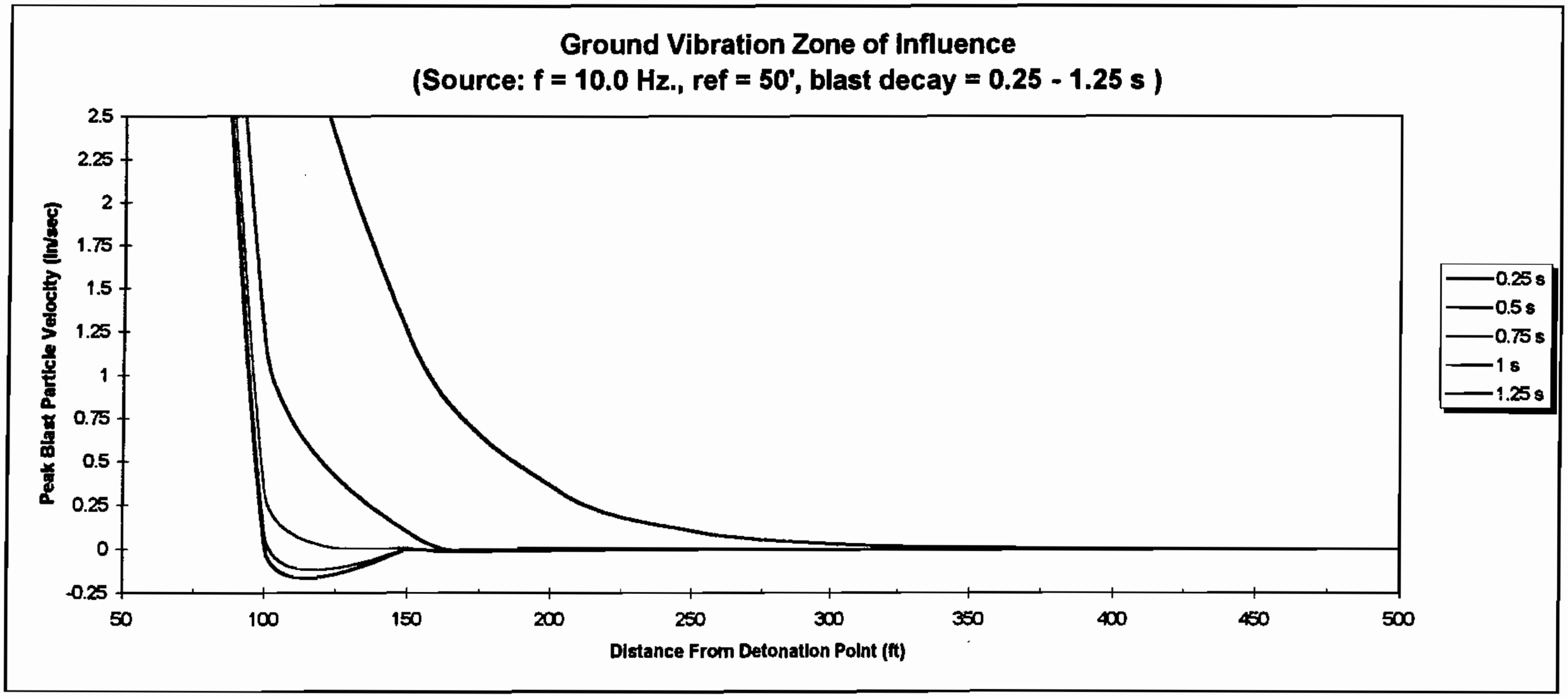


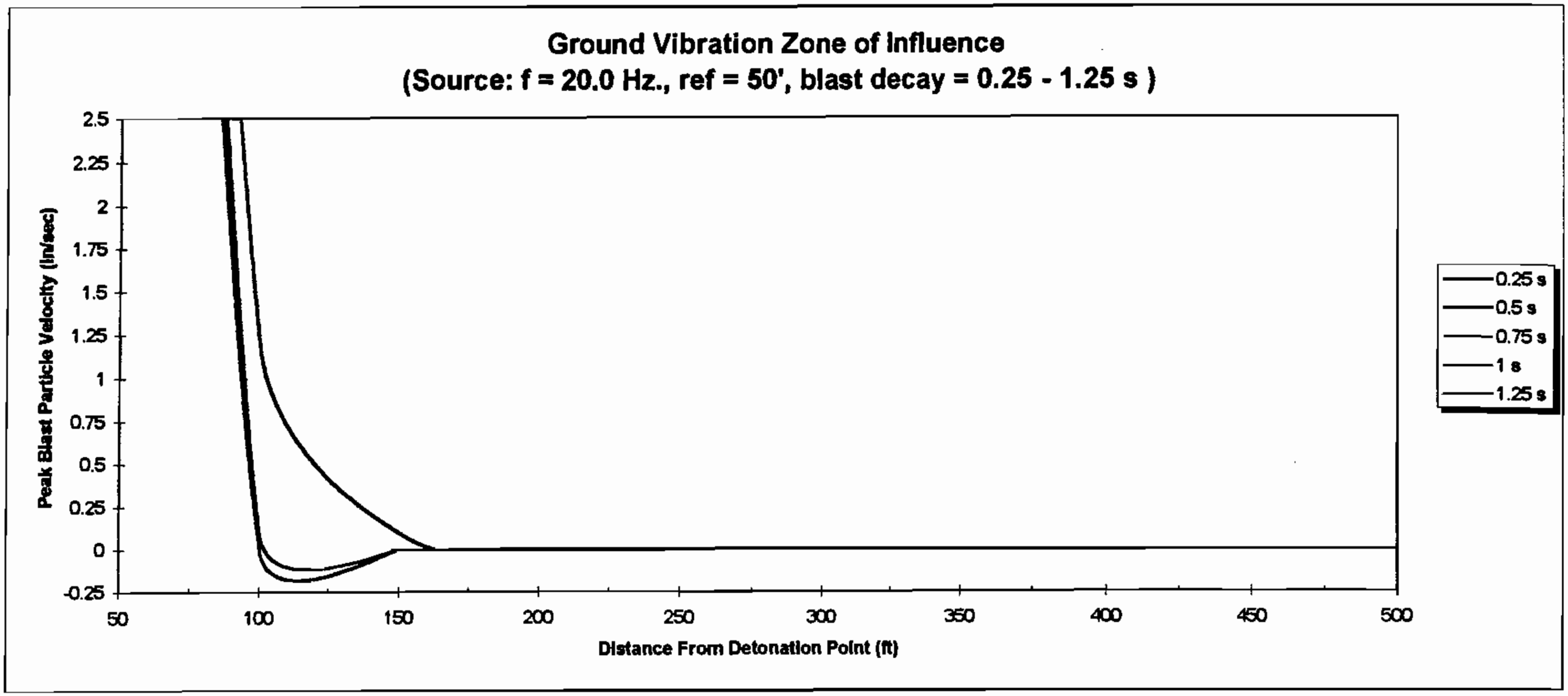
Figure 5A - Ambient Ground Response @ GF3A



Ground Motion Model Results (SDGE Pier) (15 IPS, ζ=3.17%, 5 Hz.)

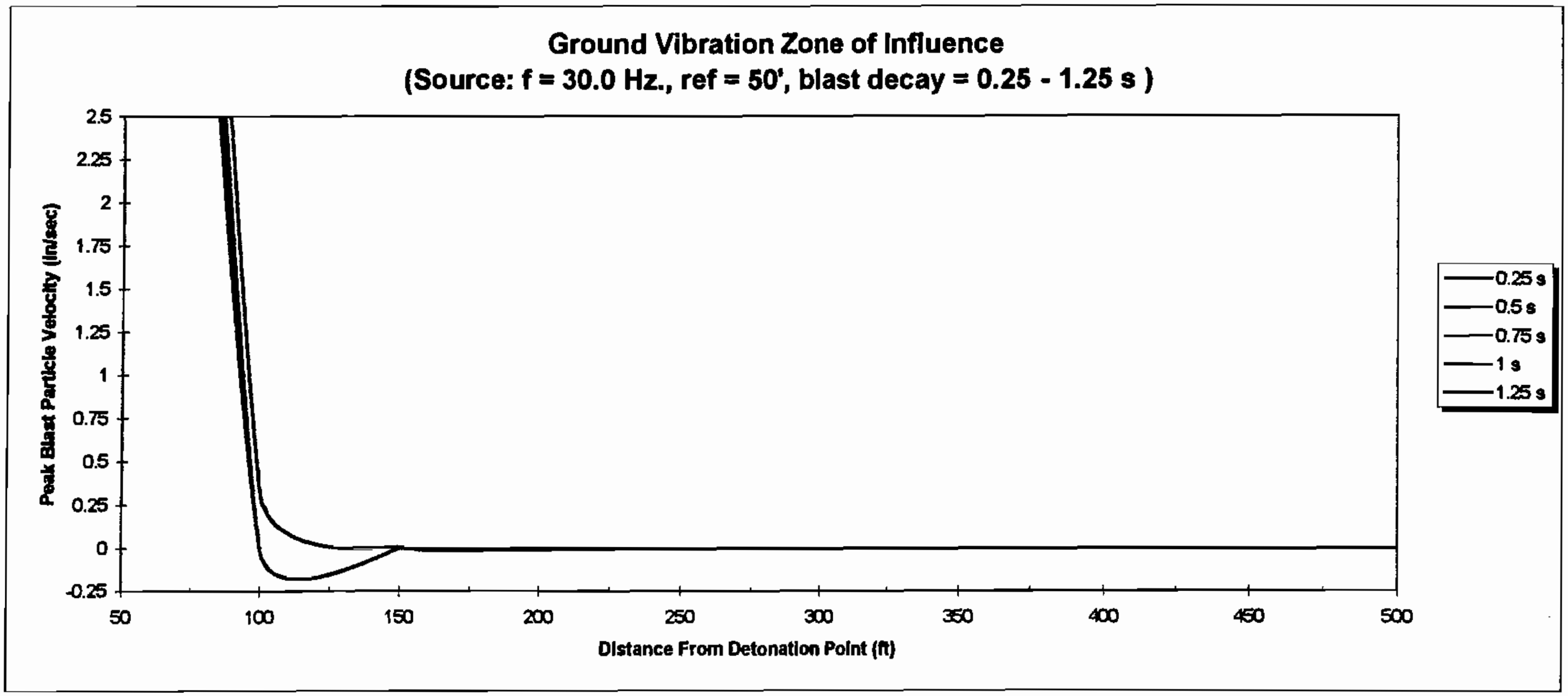


Ground Motion Model Results (SDGE Pier) (15 IPS, ζ=3.17%, 10 Hz.)

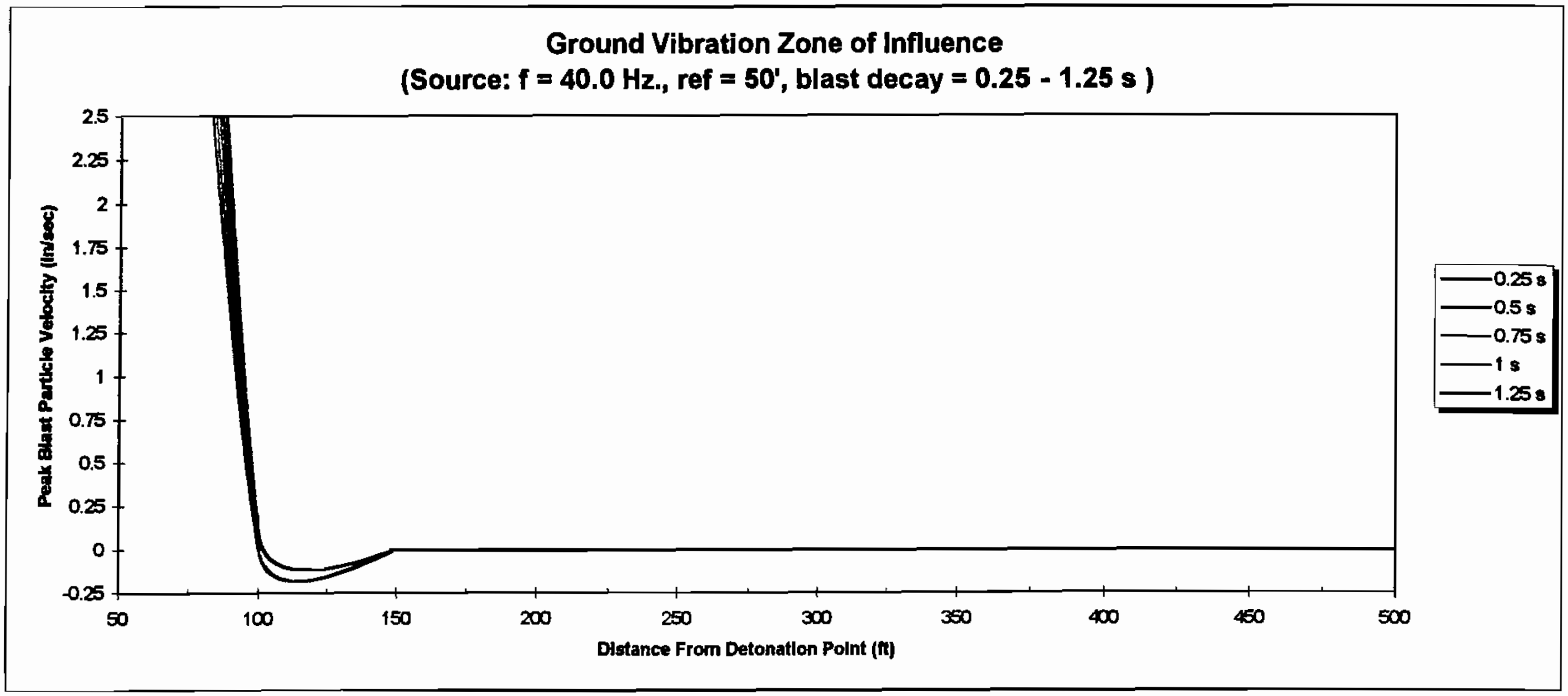


Ground Motion Model Results (SDGE Pier)

(15 IPS, ζ=3.17%, 20 Hz.)



Ground Motion Model Results (SDGE Pier) (15 IPS, ζ=3.17%, 30 Hz.)



Ground Motion Model Results (SDGE Pier) (15 IPS, ζ=3.17%, 40 Hz.)

4.6 NOISE

This section addresses project noise issues based upon the noise report prepared by Gordon Bricken (2003, revised 2006) for the Master Plan EIR (See Appendix E1). The noise section below identifies, describes and evaluates noise sources and potential conflicts associated with the proposed project.

4.6.1 Existing Conditions

4.6.1.1 Noise Definitions

Noise is often described as unwanted sound because it can cause hearing loss, interfere with speech communication, disturb sleep, and interfere with the performance of complex tasks. A decibel (dB) is a logarithmic unit of sound energy intensity. Sound waves, traveling outward from a source, exert a sound pressure level (commonly called "sound level"), measured in dBs. Environmental noise is usually measured in A-weighted decibels (dB(A)). A dB(A) is a dB corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels. In general, people can perceive a three dB(A) difference in noise levels; a difference of 10 dB(A) is perceived as a doubling of loudness

Community noise is generally not steady state and varies with time. Under these conditions of non-steady state noise, some type of statistical system of measurement is necessary in order to quantify human response to noise. Several rating scales have been developed for the analysis of adverse effects of community noise on people. These scales include Equivalent Noise Level (L_{eq}), the Day-Night Average Level (L_{dn}) and the Community Noise Equivalent Level (CNEL).

L_{eq} is the sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period. L_{eq} is the "energy" average noise level. L_{dn} and CNEL are similar to L_{eq}, but cover a 24-hour period, and apply a weighting factor that places greater significance on noise events occurring during the evening and night hours (when sleeping disturbance is a concern). L_{dn} is a 24-hour, time-weighted average, obtained after adding 10 dB to sound levels between 7:00 PM and 7:00 AM. CNEL is a 24-hour, time-weighted average, obtained after the addition of five dB to sound levels occurring between the hours 7:00 PM and 10:00 PM and 10 dB to sound levels between occurring 10:00 PM and 7:00 AM.

Each source of noise can be categorized as either a "line source" or a "point source." For a "line source" of noise, such as a heavily traveled roadway, the noise level decreases by a nominal value of three dB for each doubling of distance between the noise source and the noise receptor. In many cases, noise attenuation is increased to 4.5 dB for each doubling of distance with the combined effects of environmental factors, such as wind conditions, temperature gradients, characteristics of the ground, and the presence of vegetation.

In an area, which is relatively flat and free of barriers, the sound level resulting from a single "point source" of noise decreases by six dB for each doubling of distance. This applies to fixed and mobile sources that temporarily are stationary, such as an idling truck or other heavy duty equipment operating within a confined area, such as a construction site.

4.6.1.2 Noise-Sensitive Receptors

The project site is located within the City of San Diego. However, the nearest existing noise-sensitive receptors are single-family homes within the City of Santee, approximately 240 feet southeast of the center of the Mast Boulevard/West Hills Parkway intersection (Figures 4.6-1a and 4.6-1b). Existing habitat of the California gnatcatcher was located adjacent to the landfill site within the MHPA until the fires of October 26-27, 2003, while residentially-zoned vacant land in the City of San Diego surrounds the landfill site (Figure 4.6-2).

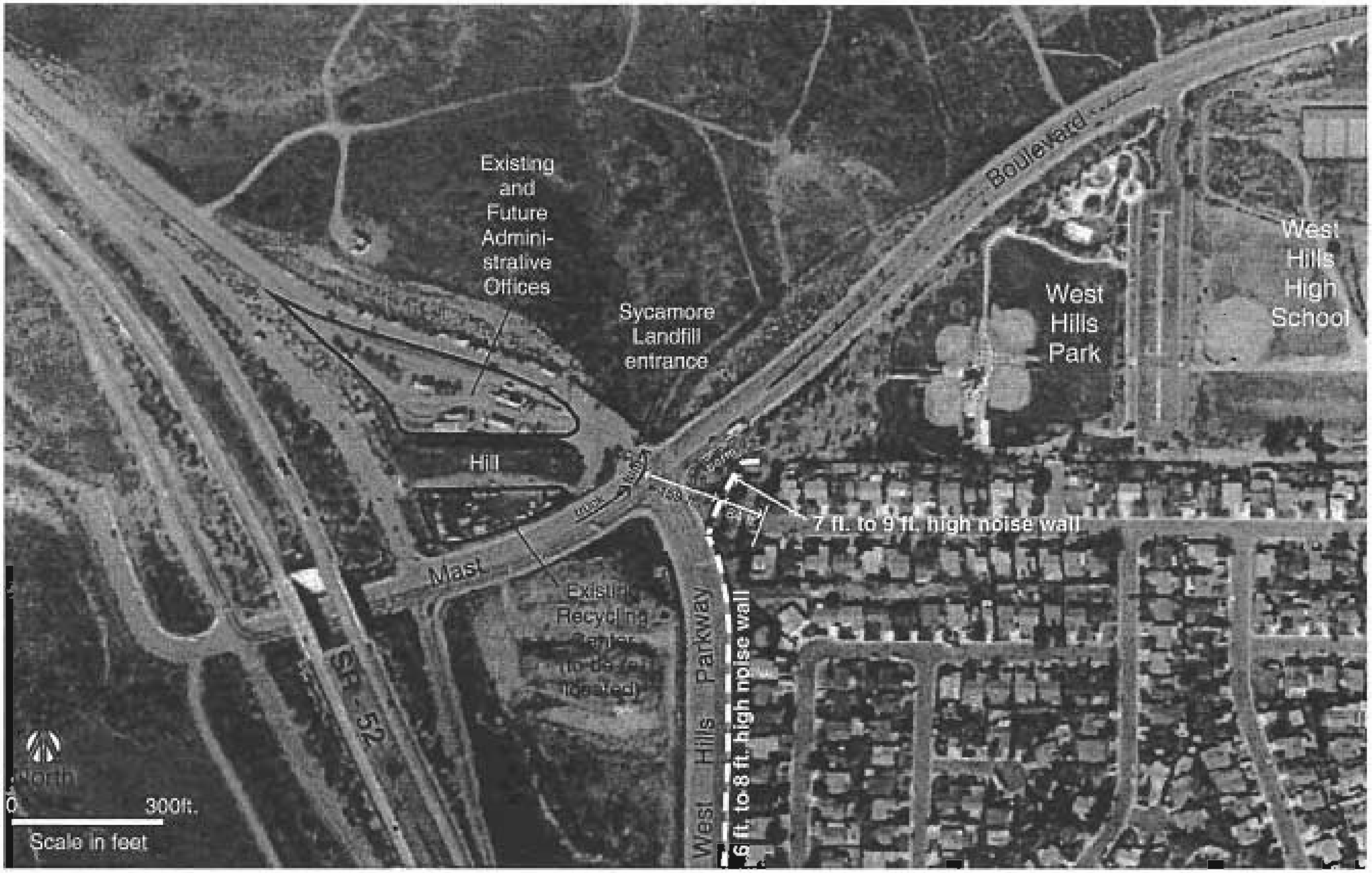
4.6.1.3 Noise Regulations

A. City of San Diego Noise Ordinance

The City's Noise Ordinance focuses on non-transportation related noise generators and provides standards that regulate onsite, indoor, and construction-related noise levels. The Ordinance establishes one-hour Leq limits for residential, commercial, industrial, and agricultural land uses by time of day. These are shown in Table 4.6-1. Industrial uses are prohibited from generating noise that exceeds 75 dB at the property line at any time during the day. In addition, the Ordinance provides that "the sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts" (San Diego Municipal Code, Section 59.5.0401B).

The Noise Ordinance has a provision that states that the allowed level at the boundary of two different land use zones is the arithmetic average of the adjacent values for those zones. Figure 4.6-2 depicts the location of land parcels adjacent to the landfill/MHPA boundary. The adjacent parcels are currently zoned residential although they are designated as open space in the applicable community plan. If residential zoning is retained, then the allowed limit at the boundary would be the arithmetic average of the residential and industrial land use zones. If the landfill is rezoned as an industrial use and the adjacent zones are R-1 residential, then the limit from 7 a.m.. to 10 p.m. (Day) would be 62.5 dB(A) Leq, the limit from 7 p.m. to 10 p.m. (Evening) would be 60 dB(A) Leq, and the limit from 10 P.M. to 7 a.m. (Night) would be 57.5 dB(A) Leq. SLI has requested that the landfill site be rezoned from Residential to Industrial (IH-2-1) in order to be consistent with the Noise Ordinance.

The City's noise standard for indoor habitable space for residential occupancy is 45 dB(A) CNEL. This same standard is required by Title 24 of the *California Code of Regulations* for single- and multi-family residences. Noise levels are typically reduced by approximately 15 dB(A) as one moves from outdoor to indoor areas; therefore, exterior noise level of 60 dB(A) CNEL or less can be accommodated without any special concerns for structural noise



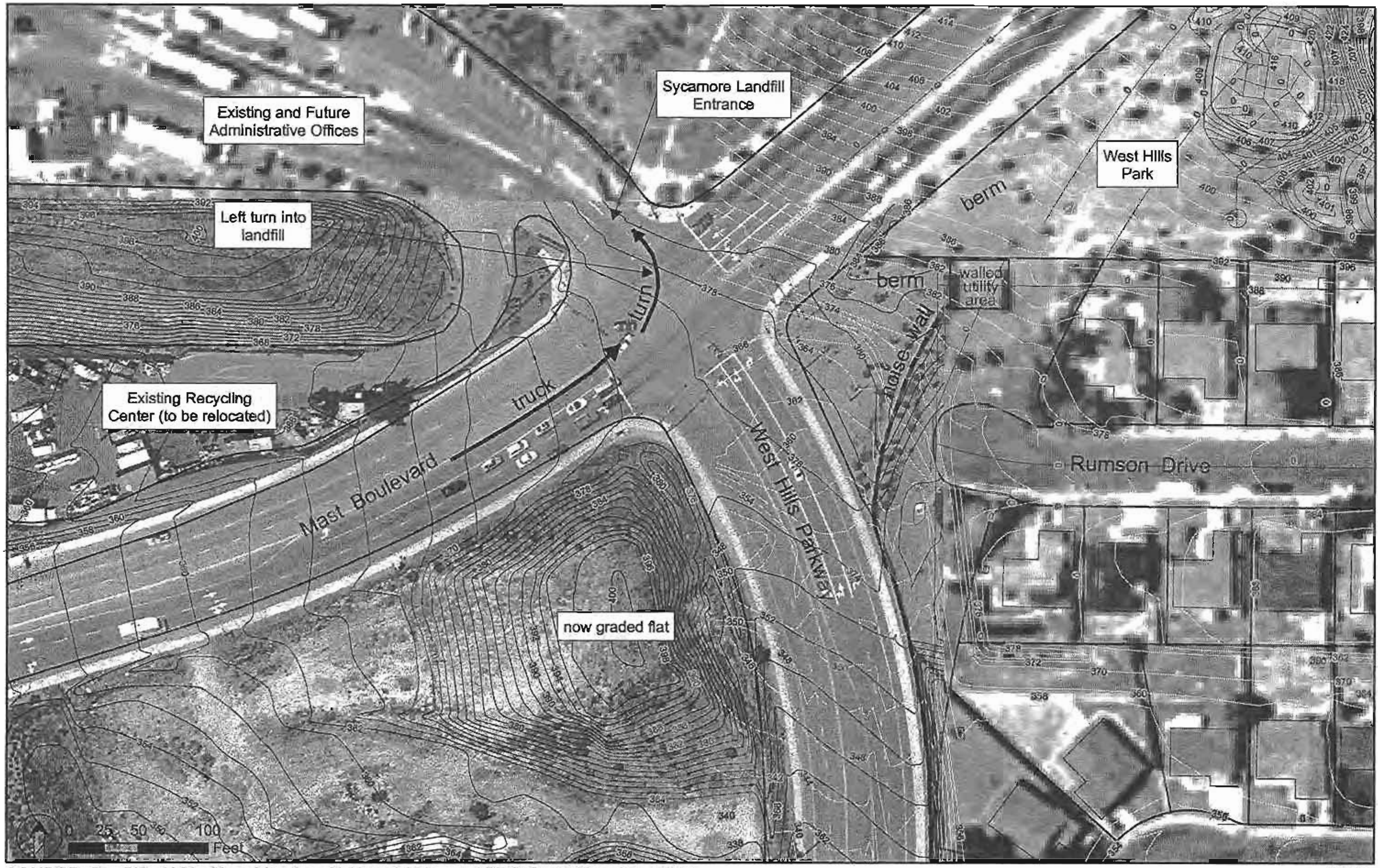
SOURCE: Aerial Photo courtesy of Landiscor, Jan. 16, 2003; BRG Consulting, Inc., 2003.

1/4/06

Sycamore Landfill Master Plan EIR

Noise Analysis Considerations Near the Landfill Entrance

FIGURE 4.6-1a



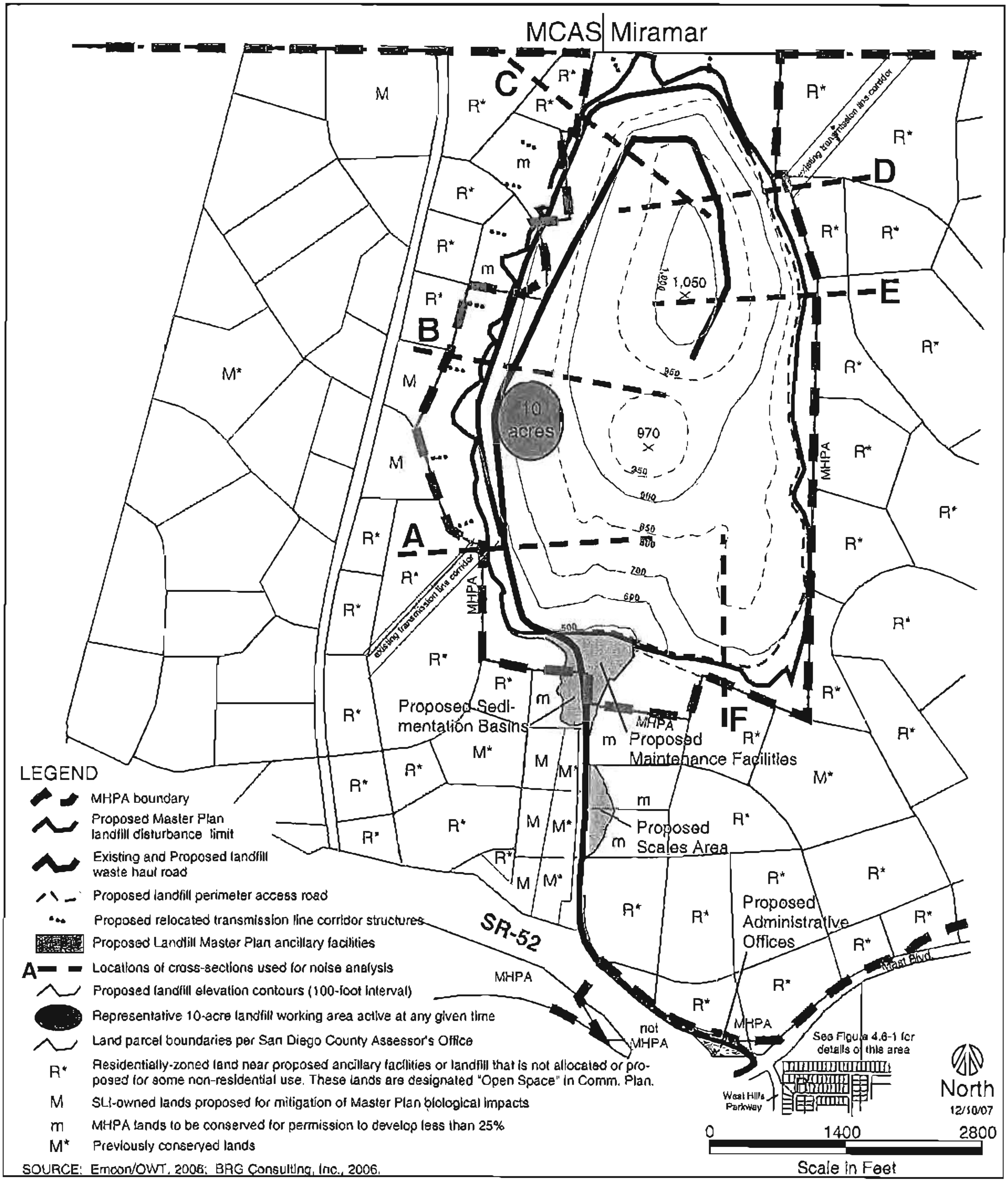
SOURCE: SanGIS, 1999, City of Santee, 2003 and 2005, and BRG Consulting, Inc., 2005

10/13/06

Sycamore Landfill Master Plan EIR

Detail of Area Near the Sycamore Landfill Entrance

FIGURE 4.6-1b



Sycamore Landfill Master Plan EIR

Generalized Project Description, and Locations of Noise Analysis Considerations

FIGURE 4.6-2

TABLE 4.6-1
City of San Diego Noise Ordinance Limits

Land Use Zone	Time of Day	One Hour Average Sound Level (dB(A) Leq)
1. **Residential:**		
All R-1	7 a.m. to 7 p.m.	50
	7 p.m. to 10 p.m.	45
	10 p.m. to 7 a.m..	40
All R-2	7 a.m. to 7 p.m.	55
	7 p.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
2. **R-3, R-4 and all Other Residential**	7 a.m. to 7 p.m.	60
	7 p.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
3. **All Commercial**	7 a.m. to 7 p.m.	65
	7 p.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	60
4. **Manufacturing and Other Industrial**	Any Time	75
5. **Construction**	7 a.m. to 7 p.m.	75

Source: City of San Diego, Gordon Bricken, 2003; BRG Consulting, Inc., 2006.

attenuation. For new "standard" construction, the difference between exterior and interior noise levels with closed windows and supplemental mechanical ventilation is typically 15-20 dB(A). Therefore, in many cases where residential uses are exposed to exterior noise levels of 65 dB(A) or less, no special treatments are necessary to meet the 45 dB(A) interior standard. The terms of the City's Noise Ordinance are given in Table 4.6-1.

Noise generated from construction-related activities is temporary in nature and does not always correspond to 24-hour CNEL standards. This is primarily because construction noise occurs only during selected times, and the source strength varies with the type of equipment in use, and the construction phase. Construction noise impacts tend to occur in discrete phases typically dominated initially by site grading, then by foundation and parking lot construction, and finally structural finishing.

B. City of Santee Noise Abatement and Control Ordinance

The City of Santee Noise Abatement and Control Ordinance establishes the noise level limits for various stationary noise sources generated on private property affecting neighboring properties. The Noise Ordinance specifies sound level limits in terms of one-hour average sound level (Leq). The Noise Ordinance requires that the daytime noise level at an outdoor area of a residential property not exceed 50 dB(A) during the daytime. Evening time (7:00 p.m. to 10 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise level limits are reduced by five dB(A) and 10 dB(A), respectively, to reflect the increased sensitivity to noise occurring during this time period. The applicable limit for residential land uses ~~for residential land uses~~ from the transportation sources operating on public roads is 60 dBA CNEL.

4.6.1.4 Ambient Noise Survey

Existing ambient noise levels of interest are those at the boundary of the landfill site, and in the residential area nearest the landfill entrance. A 24-hour measurement was made at a boundary location remote from all the existing landfill operations. The ambient noise levels at the landfill site boundary ranged from 35 dBA Leq in the early morning hours to 50 dBA Leq at mid-day.

Sound measuring instruments were placed at two locations off the southeast corner of Mast Boulevard and West Hills Parkway. There is a six-foot-high sound wall between the two locations, as well as a grade differential of about 12 feet. One instrument was placed near the existing homes, while the other instrument was placed northwest of the sound wall, on the Mast Boulevard side. Sound level measurements were conducted over a 24-hour period ~~commending~~ commencing at 12:00 p.m., Tuesday, October 4, 2005 and ending at 12:00 p.m., Wednesday, October 5, 2005. The sound level measurement outside the wall was 68 dBA CNEL, while the sound level near the existing homes was measured at 56 dBA CNEL, a difference of 12 dBA.

At the request of the City of Santee, in May 2007, indoor and outdoor acoustical measurements were also conducted in the middle of the night at a private home located southeast of the landfill entrance. These measurements are documented in EIR Appendix E4. An acoustical sound level recorder was set up in the living room of the home, with windows on the side of the home toward the landfill entrance left open. Two solid waste transfer trucks were stationed along eastbound Mast Boulevard, and at a signal started and drove into the landfill entrance. Acoustical measurements were also taken when the trucks left the landfill. No difference in sound level from when the trucks were moving versus when they were not was detected, either by City of Santee staff ;members in the home at the time, nor by the acoustical sound level recorder in the home.

4.6.1.5 Existing Noise Environment Near Landfill Operations

Measurements were conducted near the landfill working face for a period of four hours while landfill operations were in progress. These measurements recorded both noise levels from landfill working face equipment (graders, bulldozers and compactors) as well as noise from the trucks hauling the solid waste for disposal. The three measurement locations were spread out over 200 feet centered on and parallel to the landfilling area at a nominal setback of 200 feet from the working area. The 15 minute average noise levels were highest opposite and closest to the center of the landfill operations. The 15 minute average levels ranged from 73 to 75 dB(A) Leq. By combining four 15 minutes periods, the hourly levels were also found to range from 73 to 75 dB(A) Leq.

4.6.1.6 Traffic Noise Levels, Landfill Site

Noise measurements were made on the site at the truck entry station/scales and along the landfill access road within the landfill site. The average noise level at a point 40 feet from the travel line of the waste haul trucks using the landfill site was found to be 65 dB(A) Leq. The peak hourly count during those measurements was 180 truck movements, in both directions. No figure for maximum peak-hour truck operations at the 13,000 tons per day level was initially available from the traffic engineer, so the assumption was made that the value would increase proportionally to 720 truck trips per hour at the peak, adding seven dBA to the measured level. This would make the projected maximum peak-hour truck noise level based on the field noise measurements 76 dBA Leq at 40 feet. Subsequently, the maximum truck trips per hour were calculated at 479 from data in Traffic Report Table 5-5, a 266 percent increase from existing conditions. Therefore the seven dBA increase would be conservative, and overstates anticipated future truck noise levels near the access road.

4.6.1.7 Traffic Noise Levels, Residential Area Southeast of Mast Blvd. and West Hills Parkway

The nearest area of noise-sensitive land use near the existing and proposed waste haul truck landfill access route from SR-52 along Mast Boulevard to the landfill entrance is a residential area in Santee located southeast of Mast Boulevard and West Hills Parkway. The two nearest homes to the landfill entrance are located approximately 243 feet from the turn lane into the landfill. Figures 4.6-1a and 4.6-1b show a plan view of landfill truck access route(s), landfill entrance, Mast Boulevard, West Hills Parkway, and locations of residences. There is a six to eight foot high sound barrier wall along the perimeter of the residential area, on top of an earth berm, with the location shown in Figures 4.6-1a and 4.6-1b. The wall varies in height above grade because the topography is sloping, while the courses of concrete blocks used for the wall are level.

The measure of noise impact is based on the CNEL term. The CNEL term is a type of 24-hour average noise level. The calculation requires information on the 24-hour traffic volume, the mix of autos and trucks, the distribution of autos and trucks, the traffic distribution by time of day, and projected average speeds. The intersection is signalized, with turn lanes into the landfill and in close proximity to the freeway. An average speed of 35 miles per hour was used for both autos and trucks.

Bricken also conducted traffic counts, using tube counters across 10 specific roadway locations. The results are shown in Table 4.6-2. These counts were taken in order to prepare a noise level model for predicting future sound levels based on increases in both landfill-related and non landfill-related traffic.

TABLE 4.6-2
Existing Traffic Counts Used as the Basis for Noise Modeling

Lane	Period	Autos	Medium Trucks	Heavy Trucks
Eastbound Mast Boulevard	Day	5,816	261	702
	Evening	1,075	25	48
	Night	648	14	27
Westbound Mast Boulevard	Day	3,681	166	465
	Evening	602	12	9
	Night	1,644	79	239
Northbound West Hills Boulevard	Day	2,906	153	412
	Evening	321	3	3
	Night	574	41	8
Southbound West Hills Boulevard	Day	3,346	150	72
	Evening	621	11	4
	Night	464	14	5
Entering & Exiting the Landfill	Day	550	155	353
	Evening	0	0	0
	Night	82	13	55

Source: Gordon Bricken & Associates, 2006.

4.6.2 Issue 1

Would the proposed project result in a significant increase in the existing ambient noise level?

4.6.2.1 Impact Threshold

The City of San Diego has no explicit significance criterion for increases in ambient sound levels. However, three decibels is recognized by acoustical analysts as a sound level change that is just perceptible by human beings. Therefore, a three-decibel change in the average hourly ambient noise level has been utilized as the threshold of significance for this issue.

4.6.2.2 Impact

A. Landfill Expansion

Construction

Construction of the perimeter access roads associated with the landfill expansion, as well as excavation for ancillary facility sites, would require the usage of various types of equipment that have maximum sound levels up to 96 dBA at 50 feet, such as a tractor or dozer. Table 4.6-3 lists various types of equipment the construction would require, with a range of maximum sound levels, from 71 to 96 dBA. Even if the tractor or dozer was not operating continuously at the maximum level for an hour, sound levels of approximately 90 to 92 dBA Leq would be anticipated at 50 feet. Such sound levels would diminish with increasing distance, at a rate of -6 dBA per doubling of distance. Therefore, at 3,200 feet, if not blocked by intervening topography, the 90 dBA sound level cited above would diminish to approximately 54 to 56 dBA, or somewhat more than the existing sound levels in the areas near the landfill. Since that new equipment noise added to the existing background noise level would essentially double the noise level at 3,200 feet from the equipment, the result would be an increase in the ambient sound levels of approximately 6 dBA at that distance. This would exceed the three-decibel perceivable criterion, and such construction work would therefore periodically be audible to persons at that distance, or farther, such as residents of portions of the proposed Castlerock development, if approved by the City of San Diego. However, the applicable construction noise criterion established by the City of San Diego is the 75 dBA Leq limit at residential boundaries. So even though it is anticipated that the three-decibel criterion would be exceeded on a temporary, periodic, short-term basis, near specific landfill expansion construction locations, no significant construction noise impact would occur since the applicable construction noise limit of 75 dBA Leq at the residential boundary would not be exceeded.

TABLE 4.6-3
Typical Noise Levels of Construction Equipment at 50 Feet

Equipment	dB(A)
Front Loader	72-84
Backhoe	72-93
Tractor, Dozer	76-96
Scraper, grader	80-93
Paver	86-88
Truck	82-94
Concrete Mixer	75-88
Concrete Pump	81-83
Crane (Movable)	75-86
Crane (Derrick)	86-88
Forklift	76-82
Pump	69-71
Generator	71-82
Compressor	74-86
Drill Rig	70-85

Source: SDG&E, 2002.

Construction work for widening of Mast Boulevard would comply with City of San Diego Noise Ordinance standards (i.e., maximum of 75 dBA CNEL at residential boundaries), and these would occur during standard construction hours identified in the Ordinance (i.e., 7:00 a.m. to 7:00 p.m., Monday through Saturday). As a result, there would be no significant roadway widening noise impacts.

Operation

The landfill working area would encompass approximately 10 acres at a time, approximately 500 by 800 feet in size (Figure 4.6-2). The locations of these operations would move periodically, as working areas are filled. For a period of years, operations would be located below the elevation of, and some distance from, existing adjacent ridgelines. These ridgelines would serve as sound barriers between landfill operations and adjacent lands for a period of time. Cross-sections of existing and proposed topography were prepared for six locations along the western, eastern, and southern landfill boundaries, in order to project anticipated landfill noise levels at those points. Locations of these cross-sections are shown in Figure 4.6-2, and the specific cross-section diagrams can be inspected in the exhibits of the Acoustical Analysis in Appendix E1 of this EIR.

The Master Plan requests that the landfill be allowed to operate up to 24 hours per day. Hourly average landfill operation sound levels at 100 feet would be approximately 81 dBA, no matter what the time of day. The only potential difference between daytime and nighttime operation would be the need for the use of portable lighting/generator units, determined in the noise study to have typical noise levels of 66 dBA at 32 feet. At 100 feet, the noise level of such a generator would be approximately 55 dBA. This level of sound energy is approximately 26 dBA less than the 81 dBA sound level of daytime landfill operations. Since each decrease of three decibels represents a reduction in sound energy by half, the sound energy of 55 dBA would be less than 1/300th the sound of energy of the other landfill operations taking place at the same time. So, while there would be a small increase in sound levels as a result of the generator, such a small noise source is negligible compared to the other operational noise levels, and has been ignored in the noise level calculations shown in Table 4.6-4.

Noise measurements of the existing landfill operations provide a basis for projecting noise levels of future landfill operations. The relationship between projected landfill noise levels at the existing landfill property line to existing ambient noise levels is shown in Table 4.6-4. It is projected that ambient sound levels at the property line would increase by more than three decibels at all landfill boundaries when landfill operations are located near those boundaries, and there is no intervening barrier. However, the determination of whether the proposed project would result in a significant impact is not between projected project conditions and existing ambient noise levels, but rather the difference between the project and approved activities at the site. Landfill use at the site was approved by a series of City and State actions from 1963 through 2006. These actions and permits are detailed in Table 1-1 of this EIR. Projected sound levels associated with the existing approved landfill plan are provided in Table 4.6-4, with calculations made at the same cross-section locations as for the Master Plan.

Table 4.6-4 shows that project operational average sound levels at six cross-section locations along the site/residential/MHPA boundaries would range from 67.1 to 76.1 dB(A) when landfill operations were higher in elevation than existing topographic barriers. Potential noise impacts related to use of ADC would be the same as for waste disposal. Equipment to apply the ADC would be no noisier than the equipment used to apply a soil cover.

TABLE 4.6-4

Projected Average Sound Levels at Residentially-Zoned Property Line at Six Cross-Section Locations for Projected Future Landfill Operations At Proposed Grading Boundary Compared to Projected No-Project Alternative Sound Levels, and Projected Sound Levels with 15-20-foot High Berms

Cross Section	Existing Day/Evening/ Night Minimum Ambient Sound Levels (dB(A) Leq)	Projected No-Project Alternative (Allowed ~~Approved Plan~~) Sound Levels PDP/SDP 40-0765 (dB(A) Leq)	Projected Average Sound Levels Without Berm (dB(A) Leq)	Projected Increase (db(A)) Above No-Project Limits, No Barrier	Significant?	Projected Average Sound Level (dB(A) Leq), Master Plan with Berm (Ht.)	Difference, dB(A) Leq No Project v. MP With Berm	Significant with Mitigation 4.6.0?
A	41.0/ 41.0/ 35.0	60.0	76.1	+16.1	Yes	57.5(20)	-2.5	No
B	41.0/ 41.0/ 35.0	60.0	66.6	+6.6	Yes	47.7(20)	-12.3	No
C	41.0/ 41.0/ 35.0	60.0	76.1	+16.1	Yes	60.0(20)	-0.0	No
D	41.0/ 41.0/ 35.0	60.0	72.2	+12.2	Yes	52.4(20)/54.5(15)	-7.6/-5.5	No
E	41.0/ 41.0/ 35.0	60.0	76.1	+16.1	Yes	54.7(20)/56.8(15)	-5.3/-3.2	No
F	41.0/ 41.0/ 35.0	60.0	67.1	+7.1	Yes	54.0(20)	-6.0	No

Notes:

a. The ambient levels at the property line are based on recent measurements in the landfill vicinity.
b. The three values for the minimum ambient levels represent Day/Evening/Night values.
c. Minus means Master Plan sound levels would be less than projected no-project alternative sound levels. Plus means the Master Plan sound levels would be more than projected no-project alternative sound levels.
d. Barrier is assumed within 25 feet of the active operations area for all cross section locations except cross section F, where it is within 25 feet of the property line.
e. The No Project Alternative is limited to 60 dB(A) Leq at the property line, per provisions of City permit PDP/SDP 40-0765 (2002).

Source. Acoustical Analysis, Sycamore Landfill, City of San Diego, Gordon Bricken, revised 2007.

Impact 4.6.0 Landfill operations located at and near the planned limits of grading or filling would result in sound levels more than three decibels higher than the existing ambient sound levels, and more than the existing City-approved sound levels at the residential/MHPA boundary (60dB(A), Leq).

B. Transmission Line Relocation

As discussed below, no significant noise impacts are anticipated from the temporary construction activities associated with transmission line relocation.

Construction

The transmission line relocation construction would require various types of equipment with a range of maximum sound levels (see Table 4.6-3). Maximum noise levels depend on the load, engine displacement, engine shrouds, and exhaust silencers. Construction equipment would typically not operate continuously, at the same location, or at its maximum noise level. The average noise level of equipment moving from place to place and passing the same spot repeatedly over short periods of time is four to six dBA less than the maximum level. This would result in sound levels of 78 to 92 dBA at 50 feet from the construction equipment.

As a result, noise from the temporary, short-term construction activities associated with transmission line relocation (less than two years) is expected to exceed a three-decibel increase at the nearest residentially-zoned property lines. However, as discussed in Section 4.6.2.2 A, the City of San Diego has no three-decibel construction criterion. The applicable criterion is the 75 dBA Leq limit.

Although the land adjacent to the landfill is zoned residential, there are no existing or proposed residential developments near the transmission line relocation. The only known residential developments proposed in the vicinity are all located more than one mile from the proposed transmission line relocation (see Figure 5-1 in the Cumulative Analysis of this EIR). Even though sound levels would increase more than three decibels increase on a short-term basis, up to 75 dBA within 400 feet of specific tower locations, no existing or anticipated future residents would be nearby to hear it. Therefore, no significant impact associated with the proposed transmission line relocation construction would occur relative to the three-decibel level.

SDG&E personnel would utilize Protocol 60 to minimize, to the extent feasible, unnecessary construction vehicle idling time, and consequently nearby noise levels. See details of that protocol in Appendix B of this EIR.

Operation

Possible operational noise impacts include an incremental increase in existing ambient noise levels specifically during foul weather conditions associated with fog and/or rain (corona effect), and potential noise sources from inspection and maintenance of the transmission lines and substations. As seen in Table 6-12 of the Miguel-Mission 230kV #2 Project PEA, audible noise levels range from 28.7 to 40.7 dBA at the edge of the transmission line ROW even during foul weather conditions. More typical fair-weather noise levels are projected at 6.9 to 15.7 dBA at the edge of the ROW. This is far less than existing 34.41 dB(A) Leq ambient noise levels as measured by Bricken.

Periodic routine inspection and maintenance of the transmission lines involves no use of heavy equipment, and would have an insignificant effect on ambient noise levels. The minimal noise from long-term operation and maintenance of the relocated transmission lines would not change from noise levels at the existing transmission lines, and is not expected to result in a significant impact. Nevertheless, SDG&E Project Protocol 9 shall be implemented as part of the project description to reduce the potential for impacts due to increased operational noise:

- (Protocol 9) Bundled configuration conductors would be used on the 230kV circuit and relocated 69kV and 138kV lines to limit the audible noise, radio interference, and television interference due to corona. Caution would be exercised during construction to try to avoid scratching or nicking the conductor surface, which may provide points for corona to occur. In addition to the bundled configuration conductors, special hardware design-would be used to limit corona potential.

4.6.2.3 Significance of Impact

A. Landfill Expansion

The projected increase in ambient noise levels associated with landfill operations near the site boundaries would increase by more than three decibels, and therefore would be significant. However, potential construction noise levels are not subject to the three-decibel measure.

B. Transmission Line Relocation

Transmission line construction activities would not result in significant increases in ambient sound levels in areas that contain existing or proposed residential uses, and therefore, would be less than significant. In the unlikely event that one or more homes is developed and occupied on parcels adjacent to the landfill while the transmission lines are under construction, SDG&E would adjust construction activities to comply with the City's noise ordinance. Operation of the proposed transmission lines is not expected to result in a significant impact to ambient noise levels.

4.6.2.4 Mitigation Measures

A. Landfill Expansion

MM 4.6.0 SLI shall construct 15-20 foot high noise and visual barrier berms of solid waste covered with soil, or of soil and rock alone (on the eastern side), between the landfill operations area (working face) and the nearest MHPA/residentially-zoned boundary when the working face is within 1,600 feet of that boundary, and the working face elevation is above, or less than 20 feet below, existing topographic barriers between the working face and the boundary.

This measure would reduce projected maximum landfill operations noise levels at the boundary to 57.5 dB(A) Leq or less, as shown in Table 4.6-4, except where landfill operations would be within 200 feet of the MHPA/residential boundary. Those potential impacts are identified in Impacts 4.6.1a and 4.6.1b, with locations shown hatched in Figure 4.6-3. Conceptual cross-sections of approximate berms are shown in EIR Figure 4.3-4a.

B. Transmission Line Relocation

No significant impacts to ambient noise levels has been identified as a result of transmission line construction or operation. No mitigation is required.

4.6.3 Issue 2:

Would the project result in the exposure of people to noise levels which exceed the City's adopted noise ordinance?

4.6.3.1 Impact Threshold

According to the City's Significance Determination Thresholds, impacts may be significant if the project noise would exceed the following levels:

A. Temporary Construction Noise

Temporary construction noise that exceeds 75 dB(A) Leq for more than eight hours in a 24-hour period at a sensitive receptor would be considered significant. Construction is generally prohibited between the hours of 7:00 p.m. and 7:00 a.m. Additionally, where temporary construction noise would substantially interfere with normal business communication, or affect sensitive receptors, such as day care facilities, hospitals or schools, temporary impacts would be considered significant.

B. Operations

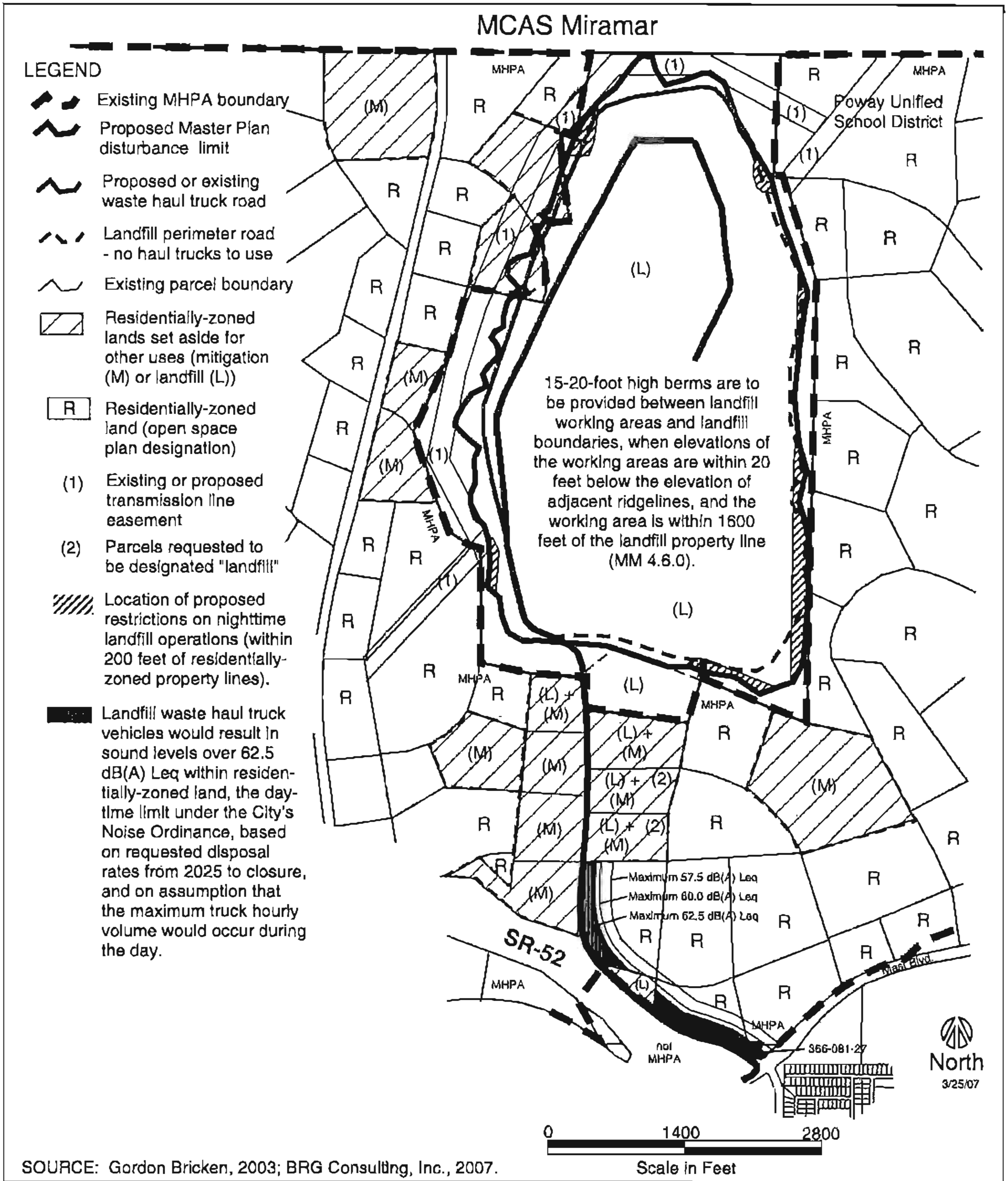
The landfill is proposed to be rezoned industrial and the adjacent zones are R-1 residential, therefore landfill operation noise which exceeds 62.5 dBA Leq from 7 A.M. to 7 P.M. (Day), 60 dBA Leq from 7 P.M. to 10 P.M. (Evening) and 57.5 dBA Leq from 10 P.M. to 7 A.M. (Night) at the nearest property line would be considered significant.

4.6.3.2 Impact

A. Landfill Expansion

Landfill Operations

Table 4.6-5 lists the projected landfill operations average sound levels at the landfill property line at each of six cross-sections, with and without the use of 15-foot or 20-foot-high sound barriers (berms). The table then compares these



SOURCE: Gordon Bricken, 2003; BRG Consulting, Inc., 2007.

Sycamore Landfill Master Plan EIR

FIGURE 4.6-3

Areas Zoned Residential Not Set Aside for Other Uses In Which Landfill Operations or Haul Vehicle Noise Would Exceed City of San Diego Noise Ordinance Limits

TABLE 4.6-5

Average Sound Levels at Landfill Property Line at Six Cross-Section Locations for Projected Future Landfill Operations At Outer Boundaries of Proposed Landfill Areas, Compared to the Allowed Noise Ordinance Limits

Cross Section	Day/Evening/Night Levels Allowed, dBA Leq (SD Noise Ordinance)	Projected Average Sound Level (dBA, Leq) Without Berm	Significant Without Berm?	Projected Landfill Operations Average Sound Levels at Property Line, dBA Leq, With Berm (Ht.)	Difference, dBA, With Berm (Day/Evening/Night)	Significant With Berm?
A	62.5 / 60.0 / 57.5	76.1	Yes	57.5 (20)	- 5.0/ - 2.5/ 0.0	No
B	62.5 / 60.0 / 57.5	66.6	Yes	47.7 (20)	-14.8/ -12.3/ - 9.8	No
C	62.5 / 60.0 / 57.5	76.1	Yes	60.0 (20)	- 2.5/ 0.0/ + 2.5	No/No/Yes
D	62.5 / 60.0 / 57.5	72.2	Yes	52.4 (20)	- 10.1/ - 7.6/ - 5.1	No
D (15 ft.)	62.5 / 60.0 / 57.5	72.2	Yes	54.5 (15)	-8.0/ -5.5/ -3.0	No
E	62.5 / 60.0 / 57.5	76.1	Yes	54.7 (20)	- 7.8/ - 5.3/ -2.8	No
E (15 ft.)	62.5 / 60.0 / 57.5	76.1	Yes	56.8 (15)	-5.7 /-3.2/ -0.7	No
F	62.5 / 60.0 / 57.5	67.1	Yes	54.0 (20)	- 8.5/ - 6.0/ - 3.5	No

Notes:

a. The allowed limits at the property line are the arithmetic average of the allowed residential and industrial limits of the Noise Ordinance.
b. The three values for the allowed limits and the difference represent Day/Evening/Night values.
c. Minus means landfill sound levels are less than allowed. Plus means the landfill sound levels are more than allowed.
d. Barrier is within 25 feet of the active operations area for all cross sections except cross section F where it is within 25 feet of the property line.

Source: Acoustical Analysis, Sycamore Landfill, City of San Diego, Gordon Bricken, revised 2007.

projected sound levels with applicable terms of the Noise Ordinance, and draws conclusions regarding significance. Without a noise berm, projected sound levels at the property line would range from 66.6 to 76.1 dBA.

Impact 4.6.1a Landfill operations located at or near the planned limits of grading or filling would result in sound levels at the landfill/residentially-zoned parcel boundaries higher than allowed Noise Ordinance limits, at all hours of the day or night.

Table 4.6-5 indicates that the landfill operations, with the use of 15-or 20-foot berms, would comply with the limits of the Noise Ordinance for 24-hour operation, at all six cross sections, except at night at cross section C, where the projected 60 dBA sound level would be 2.5 dBA higher than the City's 57.5 dBA Leq limit at that time.

Impact 4.6.1b In general, night operations near the landfill boundary even with noise berms would result in exceedances of Noise Ordinance limits (57.5 dB(A) Leq) unless they are conducted more than 200 feet from the residential boundary.

These zones where potential nighttime impacts could occur are shown with a closely-spaced diagonal hatch pattern in Figure 4.6-3.

Landfill Noise Barrier Construction

Although a 15 to 20-foot berm used would shield offsite areas from excessive noise, it would require construction periodically. This type of construction comes under the construction limits of the City of San Diego Noise Ordinance, which allows up to 75 dBA at the residential parcel boundary for up to 12 hours per day. The activity would be temporary (1-4 weeks), construction noise levels would not be constant, and during construction, some of the equipment noise would be blocked by the partly constructed berm. The berm may be located some distance from the MHPA/Residential boundary, which would decrease the potential noise impacts to the residents. Construction of the berm would be required to insure that the operations of the landfill activities comply with the applicable noise regulations.

The temporary berm construction activities would be managed by SLI to comply with applicable Noise Ordinance limits (75 dBA Leq), and with the stricter (60 dB Leq) avian standards, as described in MM 4.3.4. Therefore, there would be no significant residential impact as a result of noise berm construction.

Construction of Landfill Ancillary Facilities

Landfill ancillary facilities include sedimentation basins, maintenance facilities, scales, and administrative offices, with general locations shown in Figure 4.6-2. Construction equipment needed and their noise levels would be similar to those listed in Table 4.6-3. Figure 4.6-2 also shows the proximity of residentially-zoned parcels not allocated or proposed to some non-residential use to the ancillary facilities. In general, the residential parcel property lines are located from 350 feet to 800 feet or more from the ancillary facility construction sites. These distances would result in substantial reduction in anticipated noise levels at the residential parcel property lines. For example, if a piece of construction equipment has a peak noise level of 93 dB(A) at 50 feet, that level would be perceived as 87 dB(A) at 100 feet, 81 dB(A) at 200 feet, 75 dB(A) at 400 feet, and 69 dB(A) at 800 feet away. Therefore, it is not anticipated that construction of most of the ancillary facilities would exceed construction provisions of the San Diego Noise Ordinance. These include the sedimentation basins, maintenance facilities, and scales. However, the administrative offices construction site is located within 100 feet of a residentially-zoned parcel. It is possible that some construction activities at that site would exceed 75 dB(A) Leq during construction. However, no significant noise impact is anticipated at that location because there are no current residents on that parcel, no residential development is anticipated prior to administrative office construction (2008-2009), and construction would only occur during the day. Since no actual noise impact would occur, SLI would seek a variance from the City of San Diego to exceed limits of the Noise Ordinance on a short-term basis during office site construction.

Aggregate Processing

The currently-approved aggregate processing would continue on the site at the location and elevation approximating the grades of the base of the landfill and where the canyon intersects Cross Section E (Figure 4.6-2). The equipment includes crushers, screens and distribution belts. The initial aggregate processing location had equipment located about 875 feet from the western ridgeline at the nearest point and 1,375 feet from the property line. The western ridgeline lies between the aggregate excavation area and the property line. The aggregate excavation noise level was computed to be 35 dBA at the west property line, and 57 dBA at the south property line. These levels are below the allowed limits in all categories. Since the processing operation moved north, it remains at the bottom of the canyon, even farther from the southern property line, and results in no significant noise impact at any of the landfill property lines. No change to this operation would occur as a result of the proposed landfill expansion.

Construction and Demolition (C&D) Materials Processing

C&D materials processing, when it is initiated, would be done on top of a previously-landfilled area near the current active face. As described in Section 3.2.1.4 of this EIR, the process would presort loads that are mostly wood waste, and other loads including large amounts of concrete, asphalt and other inert materials. Clean concrete and asphalt would be stockpiled for use in preparing the wet-weather deck. Large items from mixed loads would be sorted by laborers and front-end loaders. Smaller-sized materials would be loaded into a screened sorter and conveyer system used to separate various types of small items.

Impact 4.6.1c	C&D processing would, without mitigation, result in sound levels at the landfill/residential boundary exceeding the applicable noise ordinance limits. (62.5/60.0/57.5 dB(A), Leq, day/evening/night).

Green Materials Processing

Trucks hauling green waste currently are sent to a designated location on the site where they empty their containers. The green waste is periodically loaded into a grinder, which shreds the waste and converts it to a form suitable for use in erosion control or as alternative cover used in the landfill operation. The grinding operation is usually located near the landfill area in use (working face). Therefore, the same conclusions made for the landfill operation would apply to the future grinding operation, i.e., no significant noise impact would occur.

Impact 4.6.1d Greens material processing could, without mitigation, result in sound levels at the landfill/residential boundary exceeding the applicable noise ordinance limits. (62.5/60.0/57.5 dB(A), Leq, day/evening/night).

Truck Movements

The truck access route would vary with time as the landfill operations move from place to place and as the elevation of landfill increases. The haul trucks would come no closer to the property line than the landfill operations, so the existing peak measured level of 69 dBA Leq at 40 feet would yield the results shown in Table 4.6-6. Inspection of Figures 4.6-2, 4.6-3 and 3-3 indicate that the active landfill area would usually be at least 150 feet from the nearest residential boundary. If no berm was present and nighttime truck traffic was 720 trucks per hour (four times the existing maximum truck traffic), then the trucks would need to maintain a distance exceeding 325 feet from the property line to meet the night noise limit. The trucks could come within 200 feet in the evening time period and 150 feet in the daytime period, without a noise barrier. If the evening and nighttime truck trip maximums did not exceed the current 180 trips per hour, as is considered likely, the 57.5 dB zone would be less than 60 feet and 80 feet from the road, in the evening and nighttime respectively.

Figure 4.6-4 shows that no residentially-zoned and available land would be located within 325 feet of waste haul truck routes adjacent to the main landfill parcel. An easement for the transmission line relocation at the parcel at the northwest corner of the landfill would have to be obtained prior to transmission line construction, leaving the remaining residential land more than 325 feet from the proposed haul road at that location. All other haul route locations are located more than 325 feet from residentially-zoned lands not set aside for other uses.

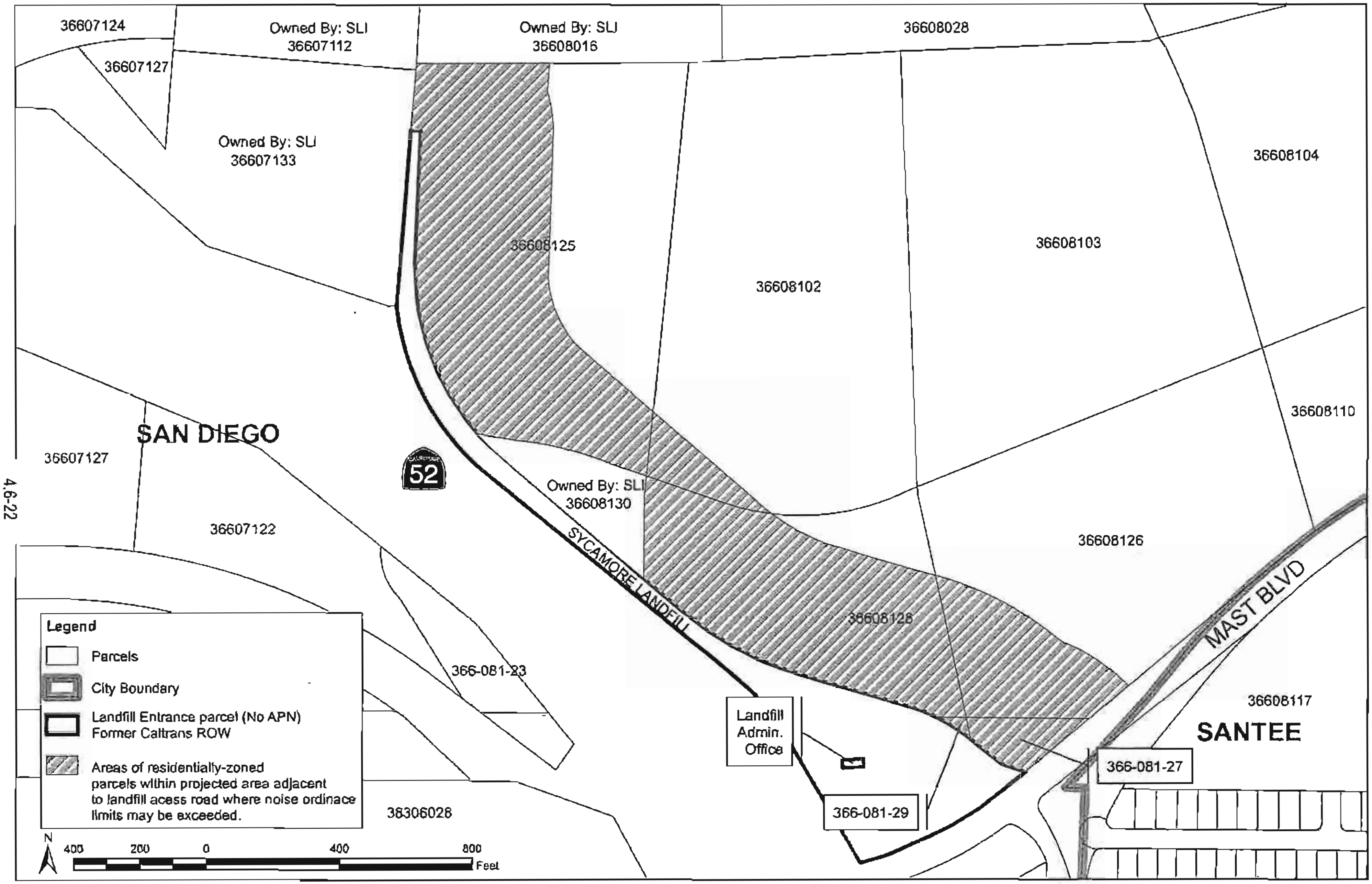
The only exception is the southerly 2,800 feet of landfill access road. At maximum disposal years of 2025 until landfill closure, and if waste truck peak trips (180 trips/hour) occurred at nighttime, the zone of waste haul vehicles nighttime noise levels greater than the 57.5 dB(A) Leq nighttime limit would extend approximately 420 feet from the landfill access road, creating significant noise impacts to any future residential development on portions of five adjacent residentially-zoned parcels. The daytime noise zone would also extend 420 feet into the parcels if the maximum number of trucks trips was 720 trips per hour. At 338 daytime trips per hour, the noise zone would extend approximately 300 feet into the adjacent residentially zoned parcels. See Figure 4.6-4 and Tables 4.6-7a and 4.6-7b. However, it must be noted that no residential development of those parcels currently exists, or is proposed. Furthermore, those parcels are within the MHPA, and any development of them will be restricted to 25 percent of their area, or less. However, potential impacts to future residential uses in those parcels is addressed in Table 4.6-7a and 4.6-7b, and Impact 4.6.2.

TABLE 4.6-6

Average Sound Levels at Landfill Property Line at Six Cross-Section Locations for Projected Existing and Projected Maximum Truck Operations on Proposed Access Roads, With No Noise Barrier Compared to the Allowed Noise Ordinance Limits

Cross Section	Day/Evening/Night Levels Allowed, dBA Leq (SD Noise Ordinance)	180 trucks per hour (Existing Maximum)		720 trucks per hour (Projected Maximum)	
		Projected Average Sound Level	Significant?	Projected Average Sound Level	Significant?
A	62.5 / 60.0 / 57.5	56.1	No	63.1	Yes
B	62.5 / 60.0 / 57.5	46.6	No	53.6	No
C	62.5 / 60.0 / 57.5	56.1	No	63.1	Yes
D	62.5 / 60.0 / 57.5	52.2	No	59.2	Yes (night only)
E	62.5 / 60.0 / 57.5	56.1	No	63.1	Yes
F	62.5 / 60.0 / 57.5	54.3	No	61.3	Yes (evening and night)

Source: Acoustical Analysis, Sycamore Landfill, City of San Diego, Gordon Bricken, revised 2007.



SOURCE: SANGIS, 2006, & BRG, 2006

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Anticipated Truck Noise Impact Areas, Impact 4.6.2

FIGURE 4.6-4

Impact 4.6.2 Potential Noise Ordinance impacts from on-site truck traffic may occur in an area adjacent to the existing landfill access road and within 420 feet of the property line of residentially-zoned parcels 366-081-25, 366-081-26, 366-081-27, 366-081-28, and 366-081-29, within which daytime noise levels of 62.5 dBA would be exceeded, or nighttime noise levels of 57.5 dBA would be exceeded. Such impacts would not occur in fact until the adjacent property is developed and used for residential purposes.

The area of potential impact is shown in Figure 4.6-4.

TABLE 4.6-7a
Anticipated Maximum Sycamore Landfill Access Road Noise Impacts to Adjacent Residentially-Zoned Parcels

Variable	Time Period		
	Daytime	Evening	Nighttime
Initial scenarios analyzed for MSW truck trips per hour (Bricken)	720	180	180
Truck Traffic Leq at the Residential Property Line (40 ft. from road) (Bricken)	76 dBA	69 dBA	69 dBA
Leq at Property Line Allowed by the San Diego Noise Ordinance (Bricken)	62.5 dBA	60 dBA	57.5 dBA
Would projected truck noise level exceed applicable noise ordinance limits at residential property line for initial truck trip scenario?	Yes	Yes	Yes

Source: Gordon Bricken and Associates, 2006; BRG Consulting, Inc., 2006

TABLE 4.6-7b
Estimated Extent of Truck Noise Impact to Adjacent Residentially-Zoned Properties Along the Access Road

Variable		Time Period		
		Daytime	Evening	Nighttime
850-ticket scenario	Estimated Maximum Number of Heavy and Medium Truck Trips/Tickets per Hour (BRG)	150/75	0/0	74/37
Leq at Property Line Allowed by the San Diego Noise Ordinance (Bricken)		62.5 dBA	60 dBA	57.5 dBA
Estimated Distance within Residential Property Line Where Noise Ordinance Limit Above Would Be Exceeded, Based on Est. Number of Trucks (Bricken)		160	0	220
1100-ticket scenario	Estimated Maximum Number of Heavy and Medium Truck Trips/Tickets per Hour (BRG)	194/97	0/0	94/47
Leq at Property Line Allowed by the San Diego Noise Ordinance (Bricken)		62.5 dBA	60 dBA	57.5 dBA
Estimated Distance within Residential Property Line Where Noise Ordinance Limit Above Would Be Exceeded, Based on Est. Number of Trucks (Bricken)		190	0	290
1925-ticket scenario	Estimated Maximum Number of Heavy and Medium Truck Trips/Tickets per Hour (BRG)	338/169	0/0	164/82
Leq at Property Line Allowed by the San Diego Noise Ordinance (Bricken)		62.5 dBA	60 dBA	57.5 dBA
Estimated Distance within Residential Property Line Where Noise Ordinance Limit Above Would Be Exceeded, Based on Est. Number of Trucks (Bricken)		300	0	420

Source: Gordon Bricken and Associates, 2006; BRG Consulting, Inc., 5/17/2006

Calculation Assumptions:

1. No noise barriers are present between the access road and the adjacent residentially-zoned parcels.
2. Traffic on the landfill access road is free-flowing.
3. The access road approximates a straight line, and has a clear 180° view.
4. The access roadway has no significant grades.
5. Landfill operating hours would be 16 hours per day, 3:00 a.m. to 7:00 p.m.

Based on discussion in Section 4.6.3.2B below, construction activities related to transmission line construction would not result in any significant noise impact.

B. Transmission Line Relocation

The nearest existing residential developments to the project within the City of San Diego are the Tierrasanta and San Carlos communities, both located 3.2 miles or more from the transmission line relocation, and on the far side of intervening ridges that block both view and sound. See Figure 5-1. The only proposed residential area within the City of San Diego near the relocation alignment is the proposed Marine Family Housing Site 8, located approximately 1.4 miles west of the transmission line route. See Figure 5-1. According to Navy personnel, the first housing to be constructed at the site will be built in 2007-2008. Even if the military housing is occupied at the time transmission line construction occurs, 2008-2010, no significant construction noise impact would occur. Peak construction noise levels of 93 dB(A) at 50 feet would diminish to less than 50 dB(A) at 1.4 miles. This is far below the City's 75 dB(A) construction noise limits. Existing housing in Santee is located from 1.0 to 1.5 miles from the proposed transmission line route, while the Treviso multifamily project is currently under construction approximately 1.7 miles south of the proposed route. Neither would incur significant construction noise impacts.

The proposed transmission line relocation would occur in the proximity of the residentially zoned but undeveloped properties on the west side of the landfill. Transmission line construction is anticipated to exceed the construction noise limits of the Noise Ordinance of 75 dBA Leq for some residentially-zoned areas near proposed transmission line tower locations. However, there would be no significant impact because there are no current residents on these properties, there are no pending development applications there, nobody is anticipated to reside there when the transmission lines are relocated (2008-2010), construction would only occur during the day, construction noise would not be constant and would vary considerably, and noise impacts at any one location would be of short duration, no more than a month at a time at any one cluster of structures. Therefore, no significant construction noise impact is expected to occur.

4.6.3.3 Significance of Impact

A. Landfill Expansion

Landfill operations, C&D processing, and greens processing near the landfill property line would result in sound levels exceeding the limits allowed under the City of San Diego Noise Ordinance, unless mitigated with provision of noise barrier berms. Construction of noise barrier berms would comply with the applicable 75 dBA Leq limit, and resulting temporary noise impacts would be less than significant. Noise impacts due to landfill operation behind these berms would be less than significant, except for potential nighttime operations within 200 feet of the landfill boundary.

Waste haul truck noise within the landfill operations area would not exceed Noise Ordinance limits in residentially zoned parcels not set aside for other uses. Near the landfill access road, haul truck noise would result in significant noise impacts to a 300-420-foot wide portion of five parcels closest to the landfill access road (Figure 4.6-4).

Construction of ancillary facilities at the sedimentation basins, maintenance facilities and scales would comply with Noise Ordinance construction procedures and limits. Therefore, no significant noise impact is anticipated regarding construction of these facilities. And, although sound levels at a residentially-zoned parcel adjacent to the proposed administrative office facilities site may exceed the 75 dBA Leq criterion, no actual noise impact would occur since no residents are expected to be present during the proposed construction period, 2007-2008. SLI would request a variance from the City of San Diego under Sec 59.5.202 3 of the Municipal Code to exceed the 75 dBA Leq criterion during administrative office construction.

B. Transmission Line Relocation

San Diego Noise Ordinance construction noise limits are expected to be exceeded during limited times due to the proximity of residentially zoned lands to the transmission line relocation, but no residential uses are or would be present nearby, and therefore no actual noise impact would occur. SDG&E would seek a variance from the City of San Diego under Sec 59.5.020 3 of the Municipal Code to exceed the sound level limits referenced in the City's Noise Ordinance during transmission line construction, based on the listed considerations. Operation of the relocated transmission line would not result in a significant noise impact relative to provisions of the San Diego Noise Ordinance.

4.6.3.4 Mitigation Measures

A. Landfill Expansion

MM 4.6.1a & b Nighttime landfill operations shall be prohibited within 200 feet of the nearest residential parcel boundary (see Figure 4.6-3) if the residential parcel(s) adjacent to the landfill has/have been developed.

MM 4.6.1c & d **See MM 4.6.0**

MM 4.6.2 Any future development of residentially-zoned parcels in the MHPA adjacent to the existing landfill access road would require environmental review by the City of San Diego. In the event such review includes a noise analysis that identifies any landfill truck traffic noise that would exceed City Noise Ordinance limits at the proposed residential use, SLI shall work with the developer of the residential use to identify feasible noise mitigation measures that would reduce the noise levels to less than significant. If the residential development subsequently is approved by the City, SLI shall provide the identified noise mitigation at no cost to the developer.

Implementation of these mitigation measures would reduce noise impacts to below a level of significance.

B. Transmission Line Relocation

No significant noise impacts have been identified for the transmission line relocation, and therefore, noise mitigation measures are required.

4.6.4 Issue 3:

Would the proposal result in the exposure of people to current or future transportation noise levels which exceed standards established in the Transportation Element of the General Plan?

4.6.4.1 Impact Threshold

According to the City of San Diego Significance Determination thresholds, the following transportation noise levels would be considered significant under CEQA:

Exterior noise levels to a proposed residential development would be considered significant if projected traffic forecasts (year 2010 through 2025) would result in noise levels exceeding 65 dB(A) CNEL at residential exterior usable areas. This does not include residential front yards or balconies, unless the balconies are part of the usable open space calculation for multi-family units. However, the City of San Diego Municipal Code has no traffic noise criteria for existing residential areas.

Within residential areas of the City of Santee, the land use compatibility criterion is 60 dBA CNEL.

4.6.4.2 Impact

Transportation noise standards are applicable only to project noise anticipated to occur along public roads and highways. Noise from vehicle trips within the project site has already been addressed in prior Section 4.6.3.

A. Landfill Expansion

Most project related traffic increases would occur on SR-52, where project traffic increases represent less than five percent of total traffic, and therefore would result in imperceptible increases in highway noise levels, over a thirty-year period. Projected landfill related traffic on West Hills Parkway and on Mast Boulevard east of West Hills would be less than one percent of total traffic on those streets, and thus any increased project traffic noise would be ~~imperceptible~~less than significant. Therefore, the key location for analysis of this issue is the existing residential area located southeast of the landfill entrance at Mast Boulevard and West Hills Parkway. Noise analysis factors at that location are shown in Figures 4.6-1a and 4.6-1b. As discussed in Section 4.6.1.7, there is an existing noise berm and wall at that location.

Using the existing traffic data from Table 4.6-2, the proposed number of solid waste truck tickets described in Table 3.2-5, and projected non-project traffic levels on nearby streets and highways that are contained in the Traffic Report (EIR Appendix D1), Bricken prepared a noise model to calculate anticipated sound levels at the residential area under several different levels of landfill activity. The 2025 scenario that was used assumed that up to 590 MSW truck trips (285 "tickets") would occur during nighttime or evening hours, with the remainder occurring during the day. Since 3:00 a.m. to 8:00 p.m. landfill operating hours were assumed in this analysis, those trips were assumed to occur in the five hours between 3:00 a.m. and 7:00 a.m., and 7:00 p.m. to 8:00 p.m. The analysis results are shown in Table 4.6-8. Project impacts at that location were found not to be significant, because they would neither exceed the three-decibel perceptible noise criterion used for Issue 1 (58.5 dBA-56dBA), nor would they exceed the 60 dBA CNEL residential area criterion used by the City of Santee. Bricken subsequently prepared an analysis of the level of landfill traffic that would result in significant noise impacts at that location. The analysis concluded that two-thirds of the proposed landfill truck trips in 2025 (2,590 of 3,850) could pass through the intersection during evening and nighttime hours from 7:00 p.m. to 7:00 a.m. and not exceed 60 dBA CNEL as long as nighttime tickets per hour were less than 259. While this scenario is not proposed, it demonstrates potential scheduling flexibility that may make minimization of other project impacts possible.

Based on the discussion in Section 4.6.4.2B below, transmission line construction activities would not result in, or contribute to, any significant traffic noise impact.

TABLE 4.6-8
Projected CNEL Noise Levels at Residential Area on Rumson Drive for Various Landfill Scenarios

Scenario	Year	Landfill MSW Truck "Tickets"		Landfill MSW Truck ADT	Projected dBA CNEL	Significant?
		Per Day	Per Hour			
1	Near-Term	620 (Approved)	18	1,240	56.8 (Baseline)	No
2	Near-Term	850*	25	1,700*	56.9*	No
3	Near-Term	1,100*	32	2,200*	57.0*	No
4	2025	1,925*	57	3,350*	58.5*	No
4 (alt.)	2025	1,925*	259	3,350*	60*	No

Notes: * Assumes implementation of a 17-hour day for landfill operations, from 3:00 a.m. to 8:00 p.m.
Source: Gordon Bricken and Associates, 2006.

B. Transmission Line Relocation

Traffic related to transmission line project construction (such as material delivery, and specialized construction and crew trucks traveling to and from pull sites, staging areas, etc.) would be short term and temporary. Such traffic would occur throughout the day, primarily outside of peak commuting times, would involve fewer than 200 vehicle trips per day during peak construction periods, and would not result in a substantial increase in existing traffic load. Projected transmission line related construction traffic is considered negligible when added to the existing daily traffic on freeways and arterial roadways, and it would not result in exceeding the established level of service standard for roads or highways in the project area (Miguel-Mission 230kV PEA, 2002). Since a doubling of traffic results in a increase of traffic noise by only 3 dB, and a difference of 3 dB is barely perceptible to most humans, it can be seen that noise impacts associated with transmission line construction traffic would be less than significant.

4.6.4.3 Significance of Impact

A. Landfill Expansion

Sound level increases at the residential area would not exceed the 65 dBA CNEL limit used by the City of San Diego, nor the 60 dBA CNEL criterion used by the City of Santee; therefore, impacts to noise levels from transportation would be below a level of significance.

B. Transmission Line Relocation

The proposed transmission line relocation would have a negligible impact on the existing traffic load and capacity of the street system, and therefore would result in no significant traffic noise impacts.

4.6.4.4 Mitigation Measures

A. Landfill Expansion

No significant transportation noise impacts were identified; therefore, no mitigation is required.

B. Transmission Line Relocation

No significant transportation noise impacts were identified; therefore, no mitigation is required.

4.6.5 Issue 4:

Would temporary construction noise adversely impact the MHPA or federally threatened coastal California gnatcatcher?

4.6.5.1 Impact Threshold

According to the City of San Diego Significance Determination Thresholds, a significant noise impact to California gnatcatcher-occupied habitats within the MHPA could result if projects exceed an average sound level of 60 dBA Leq over any hour during the bird's breeding season.

4.6.5.2 Impact

A. Landfill Expansion

Impact 4.6.3a As shown in Table 4.6-5, landfill operations, C&D processing, and greens processing at or near the planned limits of grading or filling would result in sound levels at the landfill/MHPA boundary higher than the applicable 60 dB(A) Leq average.

The landfill operations would not exceed the applicable gnatcatcher noise limit (60 dBA Leq) when operations are below the adjacent ridgelines or behind the proposed 15-foot- or 20-foot-high noise barrier berms. These berms, to the extent possible, would be constructed during the gnatcatcher non-nesting season (August 15-February 28).

Impact 4.6.3b If a landfill berm or other feature must be constructed during the gnatcatcher nesting season, a significant impact is possible if the adjacent MHPA habitat within 1,600 feet is occupied by nesting gnatcatchers.

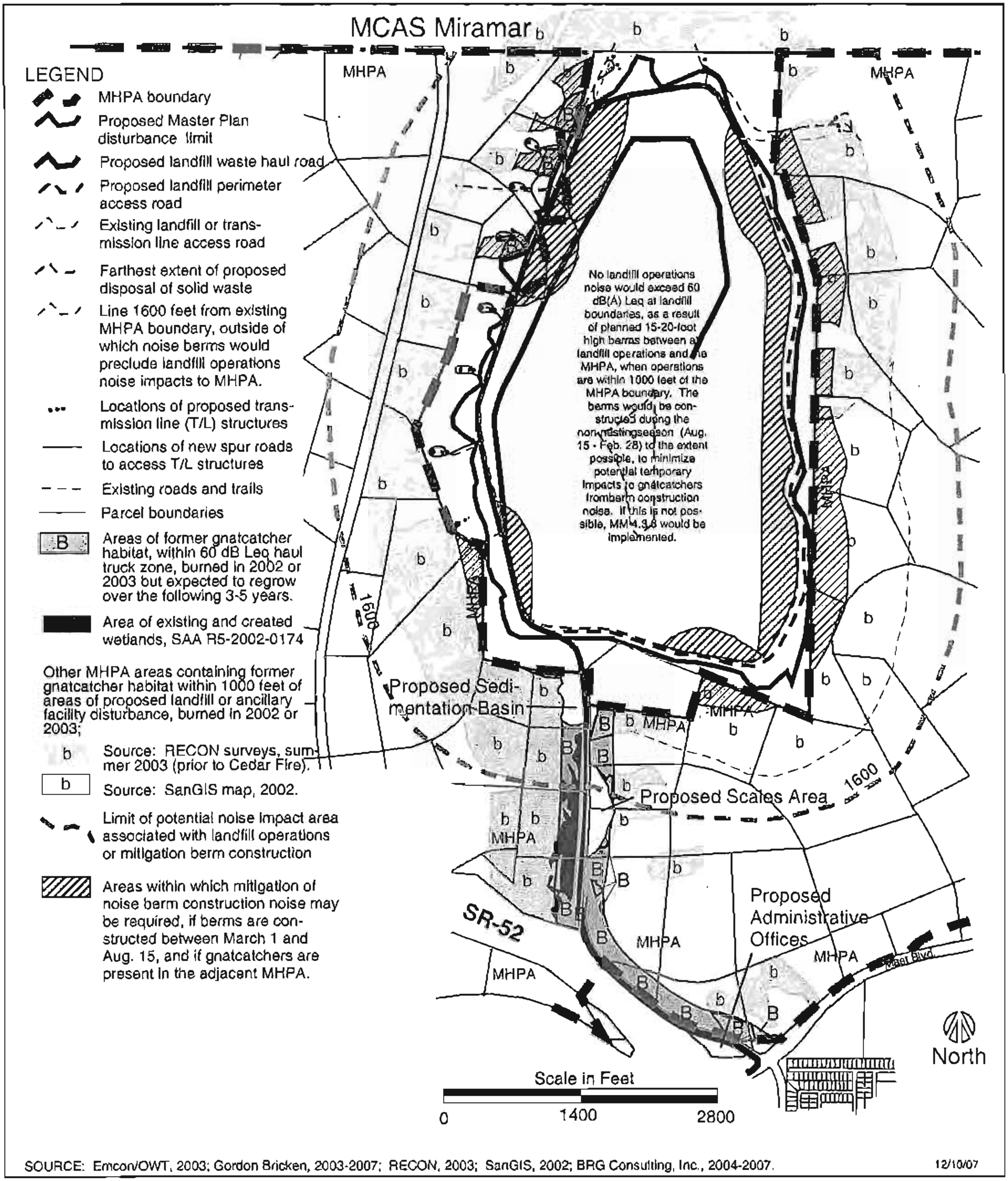
Impact 4.6.4 If landfill ancillary facilities are constructed during the gnatcatcher nesting season, a significant impact is possible if the adjacent MHPA habitat within 1,600 feet is occupied by nesting gnatcatchers.

Areas of the MHPA that contained gnatcatcher habitat prior to the fires of October 26-28, 2003, and that would be exposed to projected vehicular noise levels along landfill access roads greater than 60 dBA Leq (within 250 feet of the haul road) are shown with capital "B" symbols in Figure 4.6-5. These areas comprise 29.38 acres, and the gnatcatcher habitat within them is expected to regenerate within three to five years, depending on rainfall (RECON, 2003).

Impact 4.6.5 Approximately 29.38 acres of former and anticipated future gnatcatcher habitat would be located within the maximum projected 60 dBA Leq zone ~~near~~ within 250 feet of the landfill access road. This represents a potentially significant impact to the California gnatcatcher. However, it must be noted that the maximum impact would occur after 2025, when the requested daily tonnage is expected to reach a maximum of 13,000 tpd.

The 1.3 MW cogeneration power plant noise level was measured at 56 dB(A) Leq at 264 feet (Bricken, 2006). Following development of the proposed ancillary facilities in the Master Plan, the nearest MHPA gnatcatcher habitat would be located approximately 620 feet from the expansion area proposed for future power plant facilities. The anticipated 49.9 MW cogeneration plant projected as the ultimate facility would emit 71 dB(A) Leq at the same distance. This means that the 60 dB(A) avian limit would occur at 936 feet, without any terrain barriers or other sound-reducing features (EIR Appendix E3). However, the terrain features that exist in the facility vicinity were found to reduce potential sound levels at the MHPA boundary to no more than 45 dB(A) Leq. This is well below the avian limit of 60 dB(A) Leq, and no significant noise impact would occur as a result of the proposed cogeneration facility.

No significant noise impacts are anticipated relative to potential future composting activities. As described in Chapter 3, the composting operation, if proposed, and approved by applicable agencies (SD APCD, SD LEA, CIWMB), would be located on an area of the landfill site where MSW had previously been disposed, screened from outside view by existing topography or 15-20-foot high berms. It is expected to be located in close proximity to the greens processing area, due to the inclusion of ground greens in the compost. Potential noise issues would be minimized by the berms



Sycamore Landfill Master Plan EIR

MHPA Gnatcatcher Habitat Noise Considerations Relative to Proposed Landfill Operations, Mitigation Berm Construction, Haul Truck Noise or Transmission Line Construction

FIGURE 4.6-5

or topography, by distance, and by the low noise levels of the small pieces of equipment needed to manage the composting windrows. In addition, the noise associated with composting would not be as intense as noise associated with the existing greens processing operations. Therefore, there would be no significant noise impact if composting were implemented.

Construction work for widening of Mast Boulevard would comply with City of San Diego MHPA 60 dBA Leq noise standards in the vicinity of the MHPA boundary at the northeast corner of Mast Boulevard and West Hills Parkway. If construction work at or near that location is required during the nesting period of the coastal California gnatcatcher (March 1 – August 15) and such birds are present in the MHPA near that location, the 60 dBA Leq noise standard shall be met, through equipment scheduling or other means. However, it is considered unlikely by RECON biologists (see EIR Appendix C15) that gnatcatchers would nest in this particular area.

Other potential impacts to California gnatcatchers are discussed in Section 4.3.2 of the Biology chapter of this EIR.

Based on the discussion in Section 4.6.5.2B below, transmission line construction may result in impacts to MHPA California gnatcatchers, if nesting nearby. However, the impact would be reduced to a level less than significant through implementation of MM 4.3.9.

B. Transmission Line Relocation

Impacts to coastal California gnatcatchers would result if transmission line construction noise levels exceeded 60dB(A) Leq within gnatcatcher territories during nesting season. Recently burned gnatcatcher habitats are not expected to recover well enough to support nesting populations prior to construction of the transmission line relocation in 2006. However, if rainfall is greater than average, or if transmission line construction is delayed, the habitat may recover as nesting territory prior to or concurrent with transmission line construction. This could result in a significant noise impact to nesting gnatcatchers.

Impact 4.6.6 The proposed transmission line construction has the potential to impact California gnatcatchers nesting inside the MHPA, if they are present within 500 feet.

Transmission line operational sound levels are far below the 60 dB(A) Leq criterion, even during inclement weather, as discussed in Section 4.6.2.2 B (Operation). Therefore no significant operational impacts would occur, even after gnatcatcher habitat regenerates.

4.6.5.3 Significance of Impact

A. Landfill Expansion

Noise from landfilling operations would exceed 60 dB(A) Leq noise limits use for the federally threatened coastal California gnatcatcher unless noise barrier berms are provided as mitigation. However, construction of noise mitigation berms during gnatcatcher nesting season when the adjacent MHPA habitat is occupied by gnatcatchers is considered a potentially significant impact. Also, noise from waste haul trucks is expected to result in noise levels greater than 60 dBA Leq to as much as 29.38 acres of former and anticipated future gnatcatcher habitat located south of the landfill along the landfill access road. This is considered a potentially significant impact.

B. Transmission Line Relocation

The transmission line relocation would result in potential significant temporary construction impacts to nesting California gnatcatchers, when it has been determined that they are present in the MHPA within 500 feet of construction sites.

4.6.5.4 Mitigation Measures

With implementation of the following mitigation measures, project noise impacts would be less than a level of significance. Figure 4.6-6 summarizes potential project noise impacts areas, along with proposed locations of project features and mitigation measures to preclude significant noise impacts.

A. Landfill Expansion

MM 4.6.3a See MM 4.3.3a.

MM 4.6.3b See MM 4.3.4.

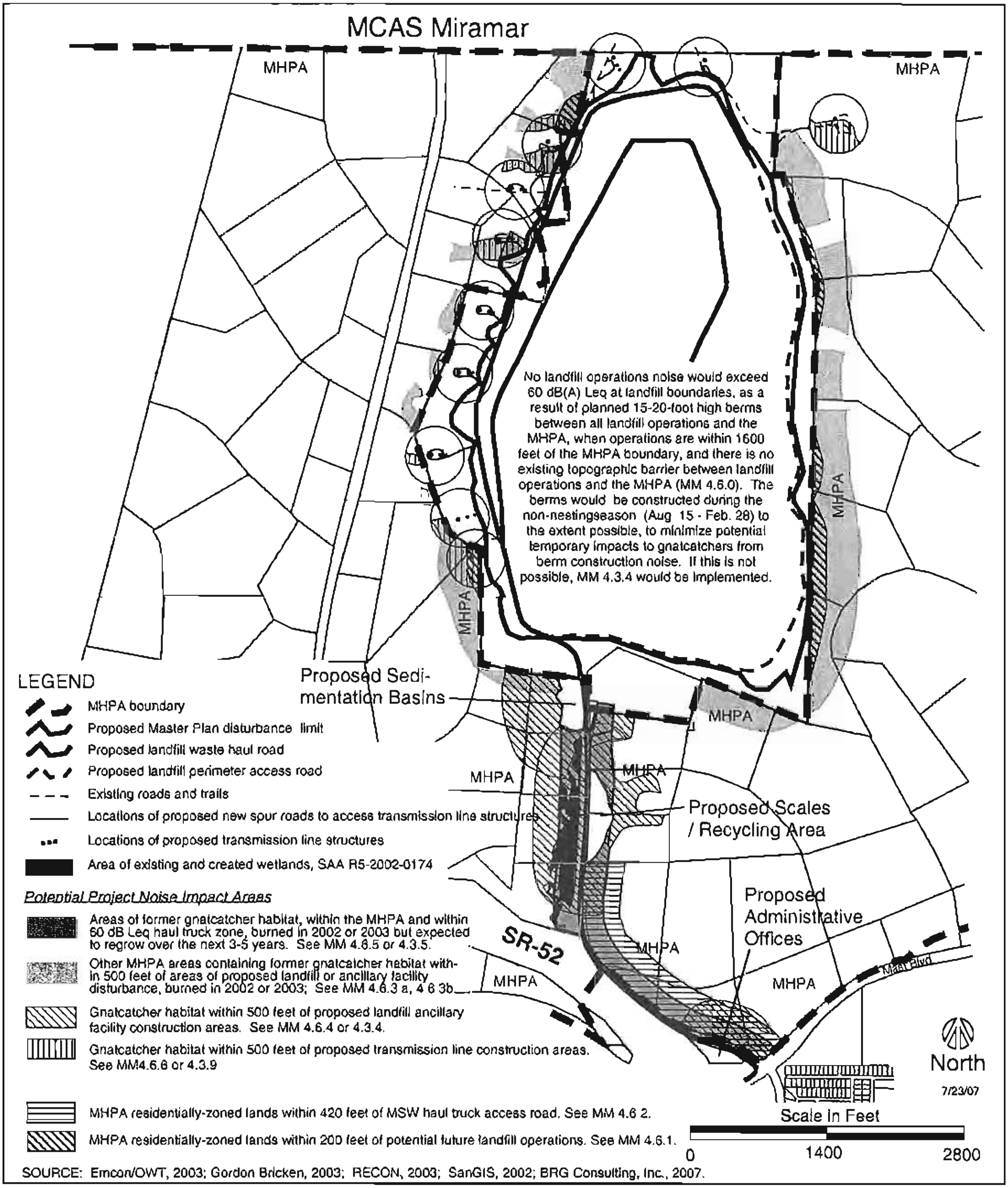
MM 4.6.4 See MM 4.3.4.

MM 4.6.5 See MM 4.3.5.

B. Transmission Line Relocation

MM 4.6.6 See MM 4.3.9.

With implementation of the mitigation measures listed above, potential noise impacts would be reduced to below a level of significance.



Sycamore Landfill Master Plan EIR

Summary of Project Noise-Reducing Features, Potential Project Noise Impact Areas, and Project Mitigation Measures

FIGURE 4.6-6

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